AD-A144 743 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS DEEP HOLLOW RESERVOIR..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV OCT 78 1/2

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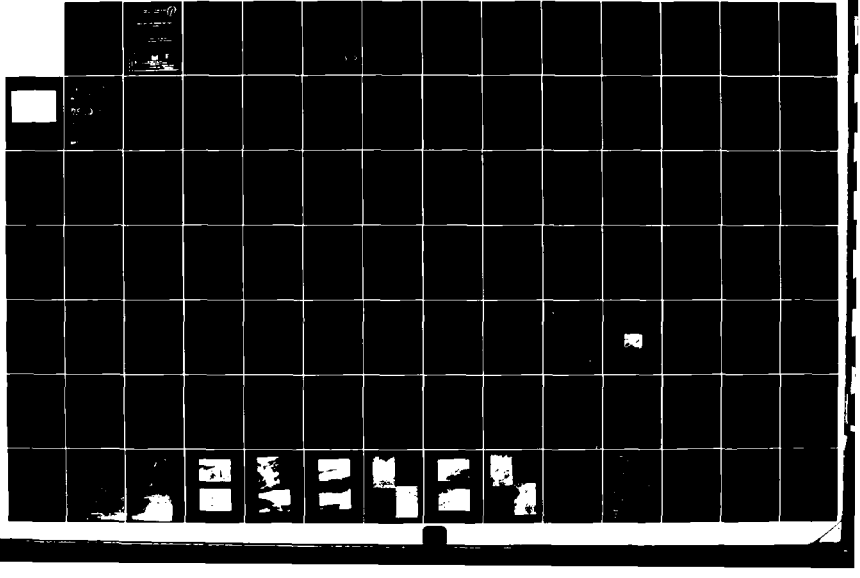

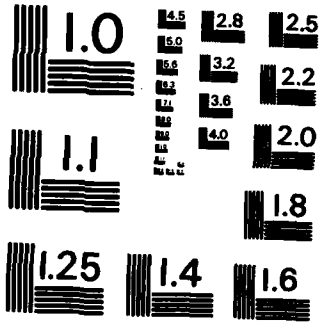

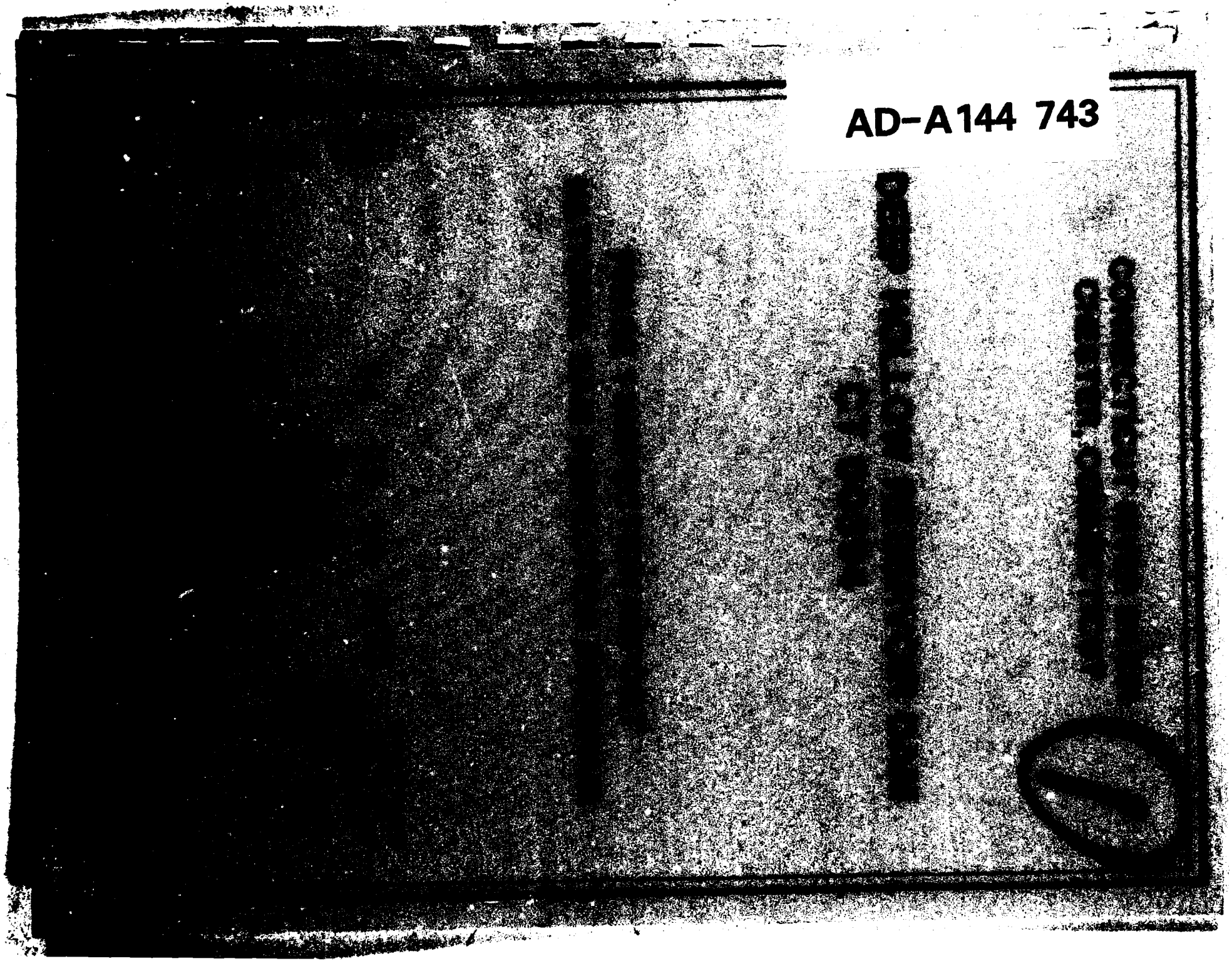
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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Connecticut River Basin
Chester, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Deep Hollow Reservoir Dam is an earth embankment with a rubble masonry downstream face. The dam is curved and approximately 352 feet long (including the spillway) with a maximum height of 24.0 feet. The crest is approximately 20.0 feet in width. The dam is considered to be in fair condition. A test flood outflow of one-half PMF is equal to 3653 cfs and will overtop the dam by 2.07 feet; the spillway is therefore considered inadequate.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDED

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

DEC 11 1978

Dear Governor Grasso:

I am forwarding to you a copy of the Deep Hollow Reservoir Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Connecticut Water Service, Inc., 93 West Main Street, Clinton, Connecticut 06413.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

DEEP HOLLOW RESERVOIR DAM

CT 00394

CONNECTICUT RIVER BASIN

CHESTER, CONNECTICUT

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 - INSPECTION REPORT

Identification No.: CT 00394

Name of Dam: Deep Hollow Reservoir Dam

Town: Chester

County and State: Middlesex County, Connecticut

Stream: Great Brook

Date of Inspection: 20 July, 1978

BRIEF ASSESSMENT

Deep Hollow Reservoir Dam is an earth embankment with a rubble masonry downstream face. The dam is curved and approximately 352 feet long (including the spillway) with a maximum height of 24.0 feet. The crest is approximately 20.0 feet in width. The spillway is a rubble masonry structure centered on the embankment and is a broad-crested, curved overflow weir 60 feet long. The outlet works is a gated 12 inch diameter pipe through the embankment. The dam was built in 1854.

The dam is considered to be in fair condition. Visible signs of concern are: a leaking and inadequately sized outlet discharge pipe, extensive seepage zones at the downstream toe, and stumps and rotting roots adjacent to the dam.

Hydraulic analyses indicate that the existing spillway can discharge a flow of 509 cubic feet per second (cfs) at elevation 233.0 (Top of Dam). Based on size and hazard classification and in accordance with Corps of Engineers' guidelines, the test flood falls between the one-half PMF and the full PMF. A test flood outflow of one-half PMF is equal to 3653 cfs (900 csm) and will overtop the dam by 2.07 feet; the spillway is therefore considered inadequate. The spillway can safely pass 509 cfs, or 14 percent of the test flood. Due to the potential for overtopping, it is recommended that a definitive plan for surveillance and a warning system be instituted for use during periods of unusually heavy rains and runoff.

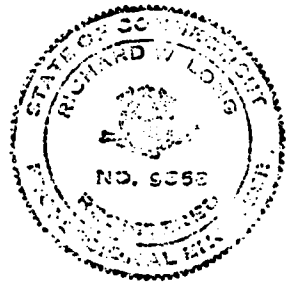
It is recommended that the Owner engage the services of an engineer experienced in the design of dams to analyze the spillway requirements with respect to the test flood and commence corrective measures to reduce the overtopping potential and improve the spillway capacity. Other action to be taken should include the immediate repair and rehabilitation of the outlet works, the monitoring of seepage to develop a system to better control the flows, analysis and design to increase the capacity of the outlet works, establish and maintain vehicular access to

the entire damsite during periods of high discharge, clear the damsite of vegetal growth and prepare an emergency action plan.

The above recommendations and remedial measures are described in Section 7 and should be implemented by the Owner within two years after receipt of this Phase 1 - Inspection Report. Alternatives to these recommendations would be to operate Deep Hollow Reservoir at reduced water surface levels during periods of expected intense rainfall or to consider flood control measures at upstream storages.

C-E MAGUIRE, INC.
by

Richard W. Long, P.E.
Vice President



This Phase I Inspection Report on Deep Hollow Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Charles G. Tiersch

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

Fred J. Ravens Jr.

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a

measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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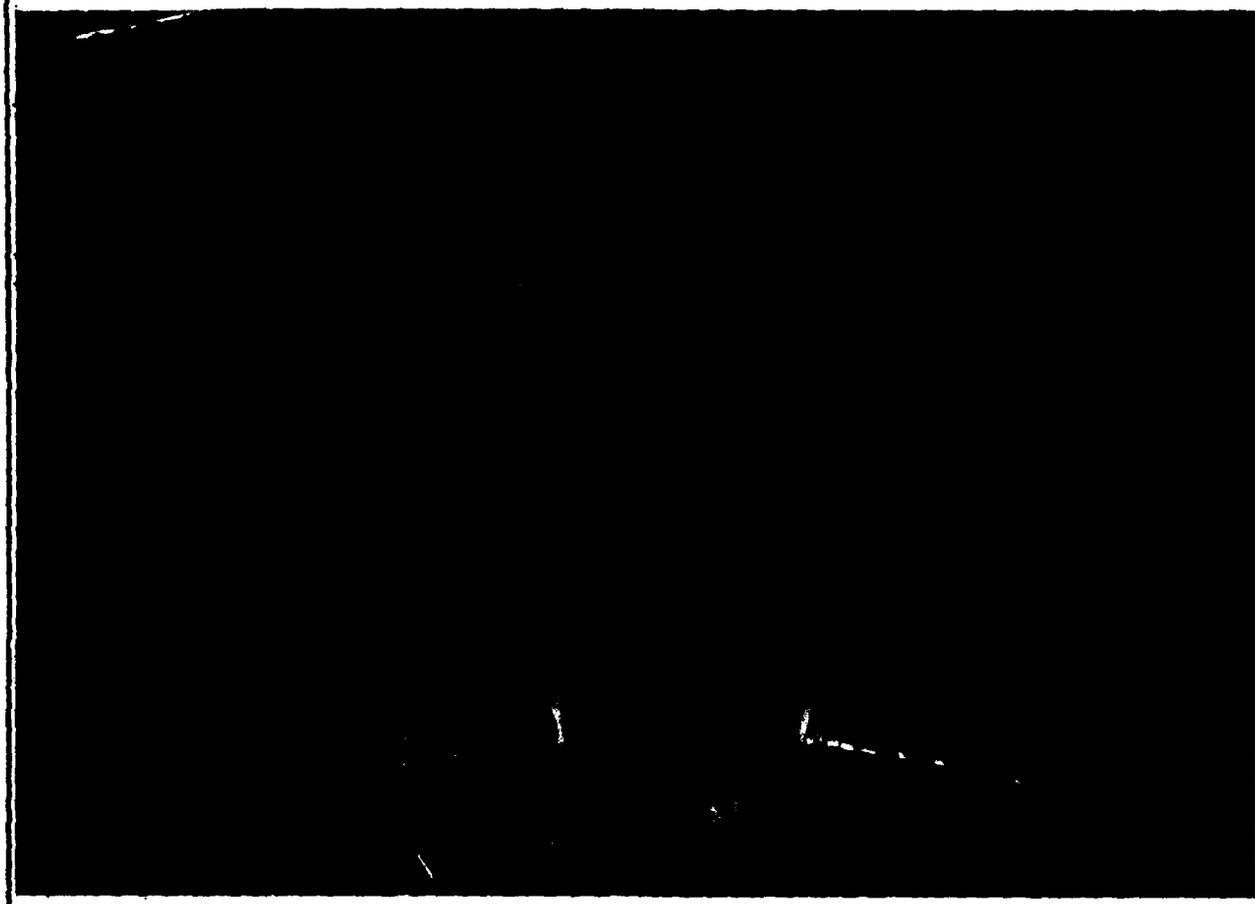
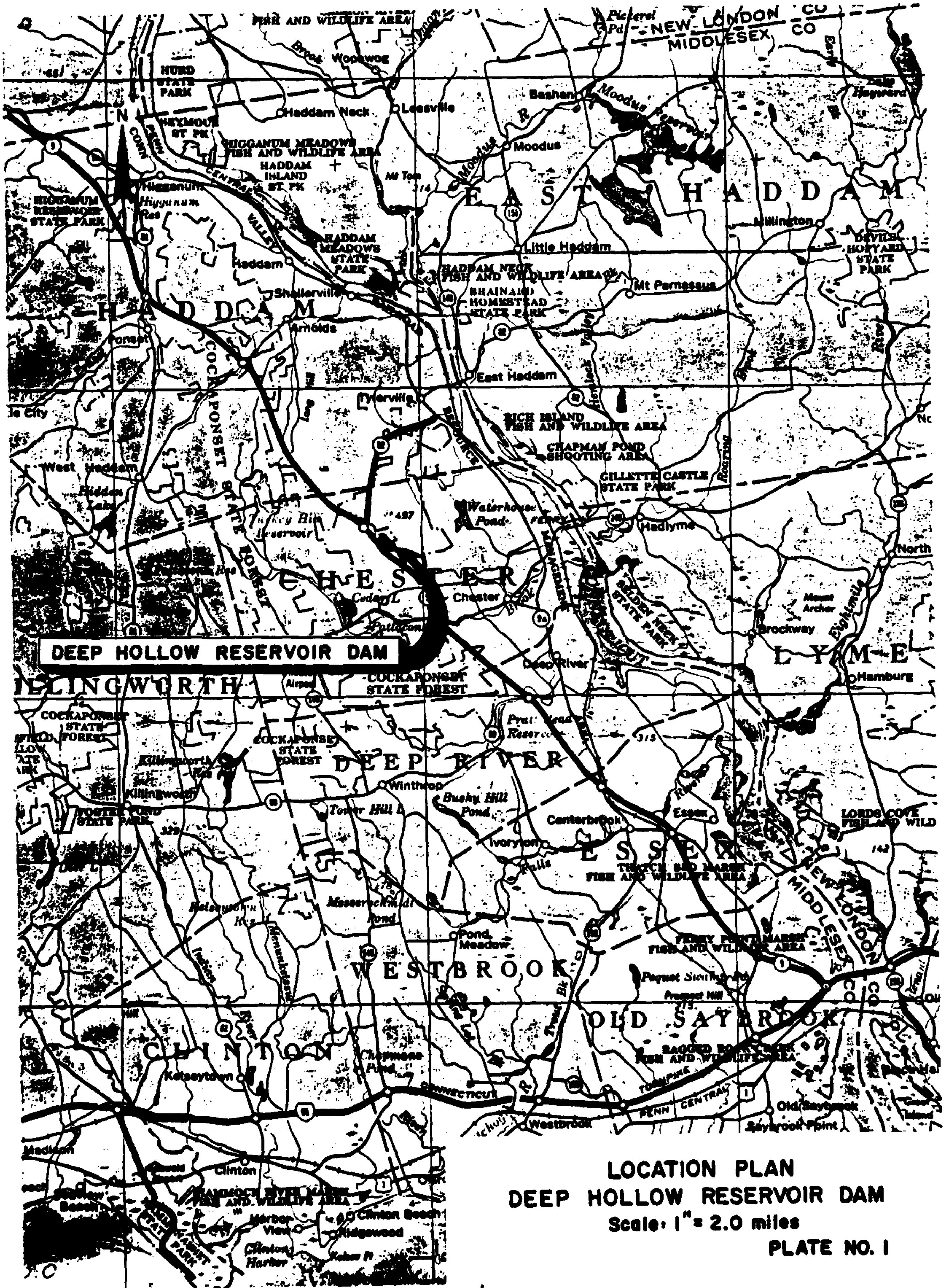


C-1 DEEP HOLLOW RESERVOIR - LOOKING UPSTREAM



LOCATION PLAN
DEEP HOLLOW RESERVOIR DAM

Scale: 1" = 2.0 miles

PLATE NO. 1

PHASE 1 - INSPECTION REPORT

DEEP HOLLOW RESERVOIR DAM - CT 00394

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. C-E Maguire, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to C-E Maguire, Inc., under a letter of 26 April, 1978, from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0300 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions

which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Deep Hollow Reservoir is located in the Connecticut River Basin, approximately 2.0 miles upstream from the Town of Chester, in Middlesex County. The reservoir has a surface area of 27.5 acres and a maximum depth of 22 feet. The watershed of 4.07 square miles drains a rolling terrain which consists of swamps and woodlands. The reservoir is located immediately east of Connecticut Route 9, adjacent to the interchange leading easterly to Tylerville. The dam is located at the south end of the reservoir approximately 500 feet east of the northbound lane of Route 9.

b. Description of Dam and Appurtenances. Deep Hollow Reservoir Dam is a curved earth embank-

ment with a rubble masonry downstream face slightly battered from the vertical. The dam is approximately 352 feet long (including the spillway) with a maximum height of 24.0 feet. The crest averages 20.0 feet in width and is grassed. The upstream face is gradually sloping with limited stone protection at the waterline. The spillway is a 60.0 foot long broadcrested overflow weir centered in the embankment of the dam. The spillway training walls are rubble masonry 2.0 feet high. The outlet works is a gated 12 inch diameter cast iron pipe leading from an upstream intake chamber at the left spillway abutment. At the downstream face of the dam, the 12 inch pipe is reduced in size to six inches and is regulated by a manually operated valve which discharges into the stream below the dam. Deep Hollow Reservoir is maintained for water supply storage for the Town of Chester, downstream. See Photos C-2 through C-11 in Appendix C.

c. Size Classification. Deep Hollow Reservoir is classified as SMALL in size because impoundment at top of dam is equal to 255 Ac.-Ft. which is

less than 1000 Ac-Ft., the maximum storage criteria for that category.

d. Hazard Classification. The dam is classified as a SIGNIFICANT hazard potential structure because it is located in a predominantly rural area where failure may damage homes, highways and interrupt public utilities downstream. No dwellings are shown on the U.S.G.S. topographic sheet between Deep Hollow Reservoir and Deuces Pond Dam. See Appendix D for Failure Analysis.

e. Ownership. The dam was originally constructed around 1854, but records are not available indicating construction methods, purpose, or Owners. More recently, the reservoir was owned by the M.S. Brooks & Sons, Inc. manufacturers of hardware equipment. In 1966, the reservoir and dam were purchased by the Connecticut Water Company, the present owners, and is operated as a water supply reservoir.

f. Operator. Operation of the dam and reservoir is the responsibility of:

Mr. William F. Guillaume
Vice-President
Connecticut Water Service, Inc.
93 West Main Street
Clinton, Connecticut 06413
Tel.: 203-669-8636.

Operations at the reservoir are conducted by personnel of the Water Company.

g. Purpose of Dam. Water Supply

h. Design and Construction History. Early records of construction or repairs are not available. The present owners repaired the outlet works and added a downstream gate in 1968, replaced large boulders utilized as energy dissipators at the toe of the spillway in 1976, and have continually placed graded cover material on seepage zones along the downstream face of the dam.

i. Normal Operational Procedures. Deep Hollow Reservoir is used for storage of water for the Town of Chester. The water is regulated such that water is released generally during July and August, to Deuces Pond, from which it is pumped into the distribution system.

1.3 Pertinent Data

a. Drainage Area. The Deep Hollow Reservoir drainage basin, located in Chester, Connecticut, is generally elongated in shape and has a length of 3.4 miles, an average width of 1.2 miles, and a total drainage area of 4.07 square miles. The

topography is generally rolling with hilltops at Elevation 550.±. Basin slopes are generally flat to moderate. These flat slopes with swampy areas tend to moderate and reduce the peak flows of surface runoff at Deep Hollow Reservoir. Runoff to the lower basin is also somewhat reduced by the Route 9 highway alignment. A location map is shown on Plate No. 1 and a basin map is included in the Appendix.

b. Discharge at Dam Site. The Owner reports that water is generally released through the outlet conduit during July and August. This water flows in the natural stream channel to Deuces Pond from which it is pumped to the distribution system. There are no discharge records available for this dam, however. Listed below are other discharge data:

(1) Outlet works (conduits) size 12 inch diameter and Invert Elev. 206.80.

(2) Maximum Known Flood at Damsite - Unknown

(3) Overflow spillway capacity at maximum pool elevation - 509 cfs at Elev. 233.0.

(4) Gated outlet capacity at normal pool elevation for 12 inch diameter pipe - 20 cfs at Elev. 231.0.

(5) Gated outlet capacity at maximum pool elevation 21 cfs at Elev. 233.0.

(6) Total discharge capacity at maximum pool elevation 530 cfs at Elev. 233.0

(7) Total discharge at test flood elevation equals 3653 cfs at Elev. 235.07.

c. Elevation (ft. above NGVD)

(1)	Top Dam	233.0
(2)	Test Flood	253.07
(3)	Full flood control pool	Not applicable
(4)	Recreation pool	231.0
(5)	Spillway crest	231.0
(6)	Upstream portal invert outlet	206.80 estimated
(7)	Streambed-centerline of dam	206.80
(8)	Maximum tailwater	212.0 est.

d. Reservoir (feet)

(1)	Length of maximum pool	2000
(2)	Length of recreation pool	2000
(3)	Length of flood control pool	Not applicable

e. Storage (acre-feet)Total

(1)	Recreation pool (Spillway Crest)	200
(2)	Flood control pool	Not applicable
(3)	Test flood elevation	310 @ Elev. 235.07
(4)	Top of dam	255

(5) Net storage between top of dam and spillway crest is 55 Ac-Ft. which represents 0.25 inches of runoff from 4.07 square miles of drainage area.

(6) One foot of surcharge represents 0.125 inches of runoff from 4.07 sq. mi. drainage area.

f. Reservoir Surface (acres)

(1)	Top Dam	27.5
(2)	Maximum pool	27.5
(3)	Flood-control pool	Not applicable
(4)	Recreation pool	27.5
(5)	Spillway crest	27.5

(6) The reservoir surface area of 27.5 Acres is 1.1 percent of the total drainage area. Thus surcharge storage and modification of inflow discharge is insignificant.

g. Dam

(1)	Type	Earth dam with downstream rubble masonry facing (soil type unknown)
(2)	Length	352 ft.inc.spillway
(3)	Height	24 ft.
(4)	Top Width	20 ft.
(5)	Side Slopes	U/S Unknown D/S 1H to 20V batter
(6)	Zoning	Not Known
(7)	Impervious Core	Not Known
(8)	Cutoff	Not Known

(9)	Grout curtain	Not Known
(10)	Other	----

h. Spillway

(1)	Type	Broad crested-overflow-uncontrolled-vertical fall and slightly curved in plan.
(2)	Length of weir	60 feet
(3)	Crest elevation	231.0
(4)	Gates	None
(5)	U/S Channel	Natural
(6)	D/S Channel	Natural, but obstructed
(7)	General	----

i. Regulating Outlets Refer to Paragraph 1.2b "Description of Dam and Appurtenances" for description of outlet.

(1)	Invert	206.80
(2)	Size	12 inch dia. pipe
(3)	Description	12 inch dia. conduit extending from intake chamber upstream of dam to gate valve at downstream face of dam. Manually operable by gate valve of 6 inch dia. at D/S end of pipe
(4)	Control Mechanism	6 inch diameter gate valve
(5)	Other	-------

SECTION 2

ENGINEERING DATA

2.1 Design. No engineering data for this dam is available. One description in a report by John J. Mozzochi and Associates dated April 5, 1966, and two inspection reports are included in Appendix B.

2.2 Construction. No record of construction or repairs for this dam exists.

2.3 Operation. No records of the operation of this facility are maintained.

2.4 Evaluation

a. Availability. There are no plans, specifications or computations available from the Owner, County or State offices regarding the design, construction or subsequent repairs of this dam.

b. Adequacy. The lack of indepth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Validity. Validity of limited data must be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. Deep Hollow Reservoir and Dam is operated as a water supply facility by its Owners. As such, it appears to be well maintained and monitored. The reservoir and damsite are fenced limiting public trespass and damaging surface wear by overuse. The top of the dam is grassed and well maintained. Downstream seepage zones have been covered with graded material and attended. Brush and trees were cleared from the damsite. No floating debris or overhanging trees were observed. In general, the dam and its appurtenances appear to be well maintained and routinely inspected.

b. Dam

1. Upstream Slope

At the time of the inspection, the reservoir level (El. 231.2) was slightly above the spillway crest, so that only the upper 2 feet of the upstream slope was exposed. The exposed riprap appears to be in good condition, but it

does not cover the upper foot of the slope which is grass-covered, as illustrated in Photo C-6 and C-7. Concrete had been used in the past to repair areas where some erosion of the upstream slope had occurred. One such area is next to the right wall of the spillway, as shown in Photo C-7.

2. Crest

The crest of the dam is grass-covered earth, which is kept mowed and shows no significant evidence of erosion nor cracks. Its vertical alignment is somewhat irregular with a mound near the right side of the spillway, possibly to warn vehicular trespassers of the presence of the spillway.

3. Downstream Face

The downstream face of the dam is composed of dry stone masonry, with an inclination of roughly 1H to 20V. The facing at the spillway location is shown in Photo C-2 and C-3. There are voids up to a few inches in diameter between the stones. There is a small seep through the facing west of the spillway and about 6 ft. below the crest of the dam. Leakage through the

stone facing at the spillway could not be seen at the time of the inspection because of the flow of water over the spillway. A subsequent examination of the dam on 3 Aug. 1978, revealed a moist area 3 to 5 ft. to the right of the right training wall and about 4 ft. above the base of the stone facing. No flow of water was observed at this location, however. At the time of this second examination, the water in the reservoir was 1 to 2 ft. below the spillway crest.

Several seeps were observed at the toe of the facing and also downstream of the dam. Their locations are shown on a plan in Appendix B. The water flowing from the seeps appears to be clear with no evidence of suspended solids. Iron staining was observed at the seeps. Some of the seeps have been covered with granular materials: three (3) with crushed stone and two (2) with sand and gravel. The owners of the dam indicated that these two types of material were placed at different times so apparently the number of seeps has increased with passing time. Photos C-10,11,12, 13 show some of the seep zones, one which is not covered with granular

materials and one which is covered with crushed stone which has water flowing out from beneath the stone.

Several large tree stumps, up to 24 inches in diameter, were observed just downstream of the base of the dam.

e. Downstream Channel

The downstream channel is the natural bed of Great Brook. There are tree branches overhanging the channel. No significant obstructions were observed in the channel in the vicinity of the dam (See Photo C-8).

3.2 Evaluation

The dam is generally in fair condition; however, the following items could influence the integrity of the dam in the future.

a. The outlet pipe through the dam is under pressure because the upstream gate is maintained in the open position. There appears to be a leak in the pipe near the exit point at the downstream face which, by itself does not constitute a safety problem, but does indicate that corrosion of the pipe has developed to the point where it may cause other leaks in the future.

If a leak develops within the earth section of the dam, it could cause piping which could rapidly endanger the safety of the dam.

b. There are several seeps at the toe of the dam. No piping was observed at the time of the inspection. It appears, however, that the number of seeps has increased with passing time which could indicate a potential hazard, since the voids in the downstream stone wall are large enough so that most soils could be carried through the wall by flowing water.

c. The stumps and associated rotting roots near the downstream toe of the dam could aggravate the potential seepage problems. If the roots extend into or beneath the base of the downstream wall, they could provide pathways for seepage and erosion.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures. Deep Hollow Reservoir is regulated by its Owners generally only in July and August. At that time, water is released through the outlet works by water company personnel to supply the pumping facility downstream at Deuces Pond. This schedule, naturally, may vary, and is contingent on weather conditions and the demand of the water supply. The reservoir is otherwise unregulated.

4.2 Maintenance of Dam. The general operations plan for the Connecticut Water Company outlines a program of monthly inspections of the reservoir facilities. These inspections are reportedly conducted by representatives of the operations staff as well as the engineering department. As mentioned in Section 3 of this report, the general appearance of the dam is good and apparently the result of a regular maintenance program. A sample checklist used in the inspections is included in Appendix B.

4.3 Maintenance of Operating Facilities. The gates of the outlet works are operated annually and generally inspected at that time for problems. The

outlet works were repaired and rehabilitated in 1968 and the procedures altered, such that control of discharges were transferred from the upstream to a downstream gate. As noted earlier in this report, it was observed during the visual inspection that a leak was evident in the outlet pipe at the downstream face of the dam, but no repair had been scheduled at that time.

4.4. Description of Any Warning System in Effect. Impending storms or intense rainfalls are monitored, as a rule, by Water Company operations and engineering personnel from weather broadcasts and the U.S. Weather Service (NOAA). During critical periods of high reservoir levels and intense storm activity, both operating and engineering staff are on call and at the site as needed, in accordance with the operations plan.

4.5 Evaluation. Operations and maintenance procedures for this dam and its appurtenances have been programmed and conducted. Maintenance of the facility is evident and operations procedures are specifically outlined in the general company-wide program. Emergency situations appear to be well monitored and controlled.

SECTION 5

HYDRAULIC/HYDROLOGIC ANALYSIS

5.1 Evaluation of Features

a. Design Data: No design data was available for this dam or watershed. In lieu of existing design information, hydrologic parameters, such as drainage area, water surface area, runoff and watershed characteristics were developed from U.S. Geologic Survey topographic mapping of the site (scale 1 inch = 2000 ft.). Elevation-storage parameters were supplied by the Connecticut Water Company. Inflow-outflow discharges for various frequencies were developed. Corps of Engineers' criteria to establish the test flood were used and the results are included in Appendix D. Some of the data used in the analysis was verified by field measurements at the time of visual inspection. Surcharge storage was approximated assuming a constant reservoir surface area above the spillway crest elevation. The dam failure discharge was determined and pertinent data has been included in Appendix D.

b. Experience Data: No historical data for discharges or water levels have been recorded for Deep Hollow Reservoir

c. Visual Observations: The following detrimental items were observed or calculated requiring correction:

1. The outlet works discharge line is a 12 inch diameter steel pipe reduced on the downstream face of the dam to accommodate a 6 inch diameter valve. At the time of the inspection, the 12 inch pipe was leaking at the face of the dam from a crack or rusted area in the line at the stonework face. This leak indicates the condition of the pipe through dam may be suspect and should be checked. Further, the present operation of regulating the discharge at the downstream face of the dam, instead of the upstream intake chamber, keeps the pipeline constantly under pressure and subject to further deterioration from pressure. Rupture or severe leakage from this pipe within the earth dam could result in possible damage or failure of the embankment.

In addition, by locating the control valve on the downstream side, an additional thrust is superimposed on the suspect pipe.

Hydraulically the 12 inch diameter pipe size is inadequate to properly regulate the water surface level.

2. The freeboard allowance is inadequate and the slope protection at the upstram face needs to be re-shaped.

d. Overtopping Potential: Deep Hollow Reservoir has a fetch of approximately 1500 feet and in accordance with the "Design of Small Dams" by the Bureau of Reclamation minimal freeboard allowances should be at least 3.0 feet. Minimal freeboard requirement defined as the difference in elevation between the crest of the dam and the maximum water surface level that would occur should the inflow test flood (one-half PMF) event take place, assuming that the spillway functions as planned. Water surface levels indicated in the table on Page 22 illustrate the inadequate freeboard allowance for even the 10 year recurring storm event.

INFLOW, OUTFLOW AND SURCHARGE DATA

FREQUENCY IN YEARS	24-HOUR TOTAL RAINFALL IN INCHES	24-HOUR* EFFECTIVE RAINFALL IN INCHES	MAXIMUM INFLOW IN C.F.S.	MAXIMUM** OUTFLOW IN C.F.S.	SURCHARGE HEIGHT IN FEET	SURCHARGE STORAGE ELEVATION
10	5.0	2.6	703	690	2.30	233.3
50	6.5	4.1	1120	1100	2.65	233.65
100	7.0	4.6	1244	1182	2.74	233.74
1/2 PMF = TEST FLOOD	11.9	9.5	3708	3653	4.07	235.07

*Infiltration assumed as 0.1"/hour

**Lake assumed initially full at spillway crest elevation 231.0
(Top of dam = 233.0.)

22

NOTES:

1. Q_{10};Q_{50};Q_{100}; inflow discharges computed by approximate methodology of Soil Conservation Service.

2. 1/2 PMF and "test flood" computation based on COE instructions and guidelines.

3. Maximum capacity of spillway without overtopping the top of the dam elevation 233.0 is equal to 509 C.F.S.

4. All discharges indicated are dependent upon the continued integrity of upstream storage reservoirs.

5. Surcharge storage is allowed to overtop the dam when exceeding the spillway capacity.

The maximum capacity of the existing spillway without overtopping and without wave action or ride up is 509 cfs. Outflow discharges for the 10 year storm and the test flood are 690 cfs and 3653 cfs (one-half PMF) respectively. The dam, therefore, is likely to be overtopped frequently. The top of the dam and abutments are not designed or protected against the erosive action of overtopping. The spillway capacity is therefore considered to be seriously inadequate.

The maximum discharge capacity of the spillway at Elevation 233.0 is equal to 509 cfs which represents 14% of the test flood of 3653 cfs.

At spillway crest Elevation 231.0, the outlet capacity is equal to 20.0 cfs, an insignificant discharge value for a drainage area of 4.07 sq. mi. It will require 16.5 hours to lower the water surface of 27.5 acres, one foot, when the level is at spillway elevation. To drain the lake completely to the invert elevation of the outlet pipe intake, will require a period of 10 days using the existing outlet. The failure discharge is 21323 cfs (see Appendix

D) which will approximately generate a water surface elevation of 226 immediately downstream of the dam. This will raise the water surface approximately 12 feet over and above the depth existing just prior to failure when the discharge is 509 cfs.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations: There were no visual indications of present structural instability.

b. Design and Construction Data: The design and construction data available do not include information concerning the cross section of the dam, the thickness of the downstream stone wall, or the zonation of the earth section; and thus it is not possible to perform stability analyses.

c. Operating Records: The operating records do not include any indication of dam instability since its construction.

d. Post-construction Changes: The owners of the dam have indicated that granular materials have been placed over seepage areas at the downstream toe of the dam, as discussed in Section 3.1b.

In 1968, the present owners of the dam lowered the reservoir to allow for maintenance work on the upstream gate of the outlet pipe.

e. Seismic Stability: The dam is located in Seismic Zone 1 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition: Based on the visual inspection, limited records and past operational performance, Deep Hollow Reservoir Dam is considered to be in fair condition. The following areas of concern must be corrected in order to assure that this facility remain functional over a long term.

1. This dam will not pass the Test Flood without overtopping the dam, and therefore the present spillway capacity is inadequate. The maximum discharge capacity of the spillway is only 14% of the test flood.
2. Existing freeboard allowance for wind generated wave action for lesser storm events will overtop the structure and could lead to potential failure if not corrected.
3. The outlet pipe through the dam is under pressure and leaking which represents a risk of internal erosion of the earth embankment caused by the development of further leaks in the pipe.

The outflow capacity of the outlet is insufficient as compared to the inflow and storage capacities.

4. Seepage at the downstream toe is extensive and appears to have been increasing with time representing a potential hazard.
5. Stumps and rotting roots downstream of the dam represent a potential hazard for seepage development.
6. During periods of increased water levels and high discharges, access to the entire structure must be assured.

b. Adequacy of Information: The lack of indepth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Urgency: The recommendations and remedial measures described below should be implemented by the owner within two years after receipt of this Phase 1 Inspection report.

d. Need for Additional Investigation: There is no evidence that formal engineering analyses were ever performed for this dam. The visual inspection and operational history indicate that attention should be given to the collection of current data in order that the recommendations listed below may be implemented.

7.2 Recommendations

a. Engage the services of an engineer experienced in the design of earthen dams to accomplish the following:

1. The maximum discharge capacity is not considered adequate. Further hydrologic studies are necessary to determine what alternative measures are necessary to significantly increase the discharge capabilities at the dam.

2. Evaluate the discharge capacity of the outlet works with respect to inflow and storage based on long term rainfall and runoff data in order to increase its usefulness. This analysis should include the redesign of a valve and gating system that will control the water level at the upstream side of the dam.

3. Investigation of the seepage at the downstream toe of the dam should be conducted to determine whether a toe drain or other structure, should be installed to control and observe the seepage.

4. The stumps and associated roots should be removed from near the downstream toe of the dam within the next year. An engineer should study the locations and extent of the root systems involved, supervise the work and select the proper backfill materials. This work can be programmed so that it will be accomplished at periods of reduced reservoir water surface levels in the maintenance schedule of the Connecticut Water Company.

7.3 Remedial Measures

a. Alternatives: As an alternate to the immediate commencement of studies to upgrade the structure, the reservoir water surface levels for Deep Hollow Reservoir should be lowered and maintained at a reduced level to provide flood control storage for storm events.

b. Operating and Maintenance Procedures:

1. The upstream gate on the outlet pipe should be closed immediately and the pressure released from the outlet pipe through the dam. In the future, the upstream gate should remain closed unless water is being released through the outlet.
2. The seepage areas at the downsteam toe of the dam should be monitored on a monthly basis over a period of one to two years. The quantity of seepage, its color and silt content, and photographs should be included in the monitoring. Any changes that may occur should be evaluated to determine whether there may be any detrimental effects on the dam. At the end of the two year period, a reassessment of the monitoring program should be made.
3. Vegetation should be removed from the area within 15 feet downstream of the dam on an annual basis to prevent the development of significant root systems.
4. Continue the regular program of monitoring, inspection and maintenance of the dam.

5. Provide and maintain vehicular access to all sections of the damsite for emergency operations.
6. Round the clock surveillance should be provided by the Owner during periods of unusually heavy precipitation. The Owner should develop a formal warning system with local officials for alerting downstream residents in case of emergency.
7. Continue the technical periodic inspections of this facility on a bi-annual frequency.

APPENDIX A

VISUAL INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

TIME 0930 to 1300

WEATHER Hazy, Calm, 80° - 85° F

W.S.ELEV. _____ U.S. _____ D.S.

PARTY:

1. R. Long - CEM
2. A. Reed - CEM
3. S. Khanna - CEM
4. R. Brown - CEM
5. R. Valles - CEM
6. G. Castro - GEI
7. J. France - GEI
8. _____
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Note: Other inspections were made on 3 August 1978 and 29 September 1978.		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	El. 231.0
Current Pool Elevation	El. 231.1
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	No pavement, grass covered.
Movement or Settlement of Crest	Too irregular to be discernible
Lateral Movement	Too irregular to be discernible
Vertical Alignment	Too irregular to be discernible
Horizontal Alignment	Arched upstream
Condition at Abutment and at Concrete Structures	Left and right abutments in good condition. Some erosion observed at upstream edges of spillway training walls.
Indications of Movement of Structural Items of Slopes	No structural items on downstream slope.
Trespassing on Slopes	None observed on downstream slope.
Sloughing or Erosion of Slopes or Abutments	Non observed.
Rock Slope Protection - Riprap Failures	Some erosion behind riprap near top of upstream slope. No riprap on top 1 ft. of upstream slope. Downstream face is stone masonry wall - no riprap.
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	Several seeps observed at downstream toe of dam. Water observed squirting

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT (CONTINUED)	
Unusual Embankment or Downstream Seepage (continued)	out of face of dam at top of outlet pipe, appeared to be a leak through the pipe wall.
Piping or Boils	None observed.
Foundation Drainage Features	None known
Toe Drains	None known
Instrumentation System	None Known
Vegetation	Several tree stumps to 24 inches diameter near downstream toe. Low brush near downstream toe.

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Holl Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	Not applicable

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Not observable, underwatter
Slope Conditions	Not observable
Bottom Conditions	Not observable
Rock Slides or Falls	None
Log Boom	None
Condition of Concrete Lining	Not observable
Drains or Weep Holls	Not observable
b. Intake Structures	Reportedly consists of a masonry chamber with steel bar grate and flap valve intake. Operated manually from crest of dam. Upstream valve always open - water surface is regulated from 6-inch gate valve at downstream end of conduit.
Condition of Concrete	Not observable
Stop Logs and Slots	Not observable

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER Not applicable	

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	12-inch diameter steel pipe (rusted) reduced to 6-inch diameter with a gate valve. Handle removed. Pipe is corroded and leaking at face of stone work.
General Condition of Concrete	Not applicable
Rust or Staining on Concrete	Not applicable
Spalling	Not applicable
Erosion or Cavitation	Not applicable
Cracking	Not applicable
Alignment of Monliths	Not applicable
Alignment of Joints	Not applicable
Numbering of Monoliths	Not applicable

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	Outlet consists of a 6-inch diameter gate valve on the 12-inch steel conduit through the dam.
General Condition of Concrete	Not applicable
Rust or Staining	Rusted
Spalling	Not applicable
Erosion or Cavitation	Not applicable
Visible Reinforcing	Not applicable
Any Seepage or Efflorenscence	12-inch section of steel conduit appears to be leaking through pipe wall at south face of dam.
Condition at Joints	Not applicable
Drain Holes	Not applicable
Channel	See Spillway Channel
Loose Rock or Trees Overhanding Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Natural earth bed
b. Weir and Training Walls	Stone and mortar walls
General Condition of Masonry	Good; no dislodgements noted
Rust or Staining	None observed
Spalling	Not applicable
Any Visible Reinforcing	Not applicable
Any Seepage or Efflorescence	None observed
Drain Holes	None observed
c. Discharge Channel	Natural stream bed
General Condition	Good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Some trees overhanging channel
Floor of Channel	Stone for first 15 feet., natural stream bed further downstream
Other Obstructions	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT Deep Hollow Reservoir Dam DATE 20 July 1978

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	Not applicable

APPENDIX B

B-1 Record Data Locations

B-2 Existing Inspection Reports

B-3 Sketches, Drawings

APPENDIX B-1

1. The Connecticut Water Company
   93 West Main Street
   Clinton, Connecticut 06413
   (203)-669-8636

2. Mr. Victor J. Galgowski, Dam Safety Engineer
   Department of Environmental Protection
   State Office Building
   165 Capital Avenue
   Hartford, Connecticut 06115

APPENDIX B-2

1. Report by John J. Mozzochi and Assoc. - Inspection of Deep Hollow Reservoir, 5 April, 1966

2. State Board for the Supervision of Dams - Inventory Data, 14 May, 1973

3. Dam and Reservoir Survey Guide - Connecticut Water Company, 9 November, 1976

JOHN J. MOZZOCHI AND ASSOCIATES
CIVIL ENGINEERS

GLASTONBURY, CONN
817 HEBRON AVENUE
PHONE 633-6401

PROVIDENCE 8, R. I.
198 DYER STREET
PHONE GASPEE 1-0420

JOHN J. MOZZOCHI
ASSOCIATES
OWEN J. WHITE
JOHN LUCHS, JR.
ECTOR L. GIOVANNINI

April 5, 1966

REPLY TO: Glastonbury

William H. O'Brien, III-Civil Engineer
Water Resources Commission
State Office Building
Hartford 15, Connecticut

Re: Our File No. 57-73-75
Chester, Connecticut

Dear Mr. O'Brien:

In your letter dated March 16, 1966, you listed five (5) dams in Chester that I was to inspect and report upon. The following is a report of my inspection.

57-73-75-No. 1 - Deuses Pond Dam

This dam is located on Great Brook about 3500' below Deep Hollow Dam which is itself located about 11,500' below Turkey Hill Reservoir. The total drainage area for Great Brook at this point, including the surface area of the three (3) ponds, is 2700 acres or 4.3 square miles. The surface area of Deuses Pond is only about 4 acres.

The dam is a dry masonry type with earth fill. The masonry facing of the south abutment is not very well built. One section of the masonry at the flume location in the north abutment has been mortared and apparently water power is still being used by the mill located immediately below the dam. The top 5 feet of the spillway is of concrete.

The dam consists of an earth-filled south abutment about 18' long by 12' wide, a curved spillway about 80' long and an earth filled north abutment about 60' long by 20' wide. The maximum height at the spillway is about 20' with ledge exposed at the base. The freeboard is only about 18" at the north and about 24" at the south. This obviously provides for complete overtopping of the dam during flood discharges.

In view of the above, I recommend that the south abutment be improved and strengthened by increasing its width and rebuilding the masonry facing in a more substantial manner. Part of the north abutment masonry facing should likewise be strengthened.

57-73-75-No. 2 - Deep Hollow Dam

This dam is located on Great Brook about 11,500' below Turkey Hill Reservoir. The total drainage area, including the Turkey Hill Reservoir drainage area, is 2460 acres

or 4 square miles. The surface area of the pond is about 30 acres.

This is an earth fill dam with dry masonry facing in very good condition. The whole dam is built on a curve with convex upstream. Both the north and south abutments are about 100' long by 20' wide and the spillway is about 50' long. The maximum height at the spillway is about 30' and the freeboard is only 2'.

This dam can safely be overtopped during flood run-off. No work is needed at this time.

57-73-75-No. 3 - Roger Gladding Dam

This is a small masonry dam about 40' long and 20' high set in between and on ledge. It is my understanding that this dam will be eliminated by the reconstruction of the adjacent Hooppole Road which has to be relocated to provide for a ramp of Route 9.

At any rate, the dam is in fair condition and no work is required at this time.

57-73-75-No. 4 - Pataconk Reservoir

This is an earthen dam located in the Cockaponset State Forest. It has a drainage area of 2.5 sq. miles with a pond area of 60 acres. The south abutment or dike is about 300' long with a top width of about 20' and a maximum height of about 20'. The north abutment is only about 20' long with only a 4' height. The spillway is about 20' wide with concrete threshold, sides and apron and discharges into a steeply sloped channel running along the old ground. The freeboard is 24 inches.

Being a State Park, the top of the south dike is used as a picnic area. It is covered with a heavy growth of trees and saplings which should be removed. The top surface is interlaced with roots and there is no sod protection. This should be rectified. The discharge channel is separated from the south abutment only by a small ragged dike which should be raised and strengthened. Finally, I recommend that the freeboard of the south abutment be increased at least 2' more to prevent any possible overtopping; This will direct flood flows over the north abutment which is practically at natural ground level.

57-73-75-No. 5 - Cedar Lake

This lake is formed by a natural depression without the benefit of a dam. Discharge is at the southwest corner of the lake by means of a 6' wide sluiceway outletting through a small bridge 10' wide under Route 148.

Very truly yours,

John J. Mozzochi and Associates
Civil Engineers

JJM:hk

14 MAY 1963
WPS

STATE BOARD FOR THE SUPERVISION OF DAMS
INVENTORY DATA

T-394

Name of Dam or Pond DEEP HOLLOW RESERVOIR

Code No. _____

Location of Structure

Town CHESTER

Name of Stream GREAT BROOK

U.S.G.S. Quad. DEEP RIVER

Owner M.S BROOKS AND COMPANY

Address CHESTER

Pond Used For WATER POWER, STORAGE

Dimensions of Pond: Width ± 700 FEET Length ± 1700 FEET Area 27.5 ACRES

Total Length of Dam ± 300 FEET Length of Spillway ± 65 FEET

Depth of Water Below Spillway Level (Downstream) ± 50 FEET

Height of Abutments Above Spillway ± 2 FEET

Type of Spillway Construction CONCRETE CAP

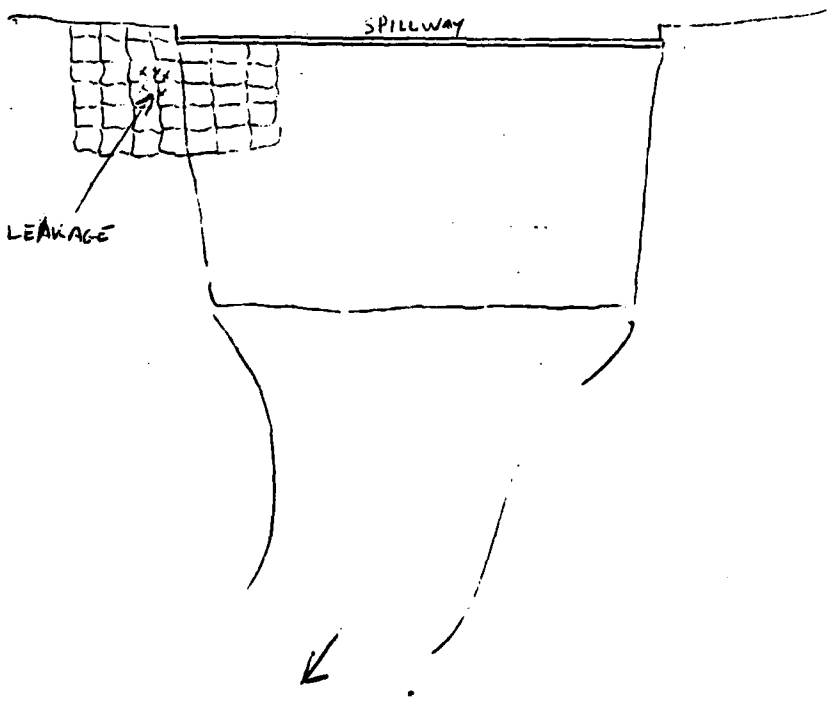
Type of Dike Construction ROCK, EARTH UPSTREAM

Downstream Conditions WOODS

Summary of File Data _____

Remarks DAM BUILT IN 1859, SOME LEAKAGE THROUGH RIGHT SIDE. FAILURE OF DAM WOULD CAUSE DAMAGE DOWNSTREAM.

1359


SPILLWAY
LEAKAGE

DAM & RESERVOIR SURVEY GUIDE

ACCOUNT NAME: The Connecticut Water Company
ADDRESS: 93 W. Main Street, Clinton, Ct. 06413

STRUCTURE NAME: Deep Hollow Res. (Wilcox
LOCATION: Great Brook, Chester

1.0 GENERAL INFORMATION
1.1 Year Built: 1854
1.12 _____. Designer: unknown
1.2 Seismic Zone: _____. Designed to seismic zone: Yes ☐ No ☒
1.3 Use: Single ☒ Multi-purpose ☐ Flood Control ☐ Water Supply ☒
Irrigation ☐ Industrial ☐ Recreation ☐ Power ☐ If power, is there an alternate supply? Yes ☐ No ☐

2.0 CONSTRUCTION

2.1 Concrete ☐ Gravity ☐ Arch ☐ Buttress
2.2 Masonry ☐ Stone ☒ Brick ☐ Block ☐ stone gravity with earth upstream
2.3 Earthen ☐ Compacted ☐ Hydraulic Fill ☐ Rock Fill ☐ Impervious Core ☐
2.4 Impervious Upstream Face: Yes ☐ No ☐ Type: Concrete ☐ Steel ☐
Timber ☐ Plastic Sheet ☐ Asphaltic Sheet ☐
2.5 Dimensions: Length 300 Ft., Width Top 20 Ft., Width Bottom 40' Ft., Height 22 Ft., Freeboard 2 Ft.
2.6 Flashboards: Height None Ft. When used _____ or permanent type
Bascule Gates: Height _____ Ft.

3.0 WATERSHED

3.1 Run-Off Area 2640 Acres 4.12 sq.mi. which includes Turkey Hill
3.2 Other control dams, Upstream: Yes ☐ No ☐ Distance 11,000 Miles; Turkey Hill
Downstream: Yes ☒ No ☐ Distance 3500' ~~Miles~~ Deuse
3.3 Tributaries Upstream: Great Brook
Downstream: Great Brook
3.4 Rainfall for Area: Average _____ In. _____ Time; Highest _____ In. _____ Time.

4.0 RESERVOIR

4.1 Storage Capacity: Normal 200 Acre/Ft., Flood _____ Acre/Ft. 65 MG
4.2 Pond Area 25.6 Acres. Maximum Depth 19 Ft.
4.3 Fetch 2200 ft. ~~Miles~~. High wind velocity for area _____ MPH

5.0 RESERVOIR CONTROLS

5.1 Spillway ☐ Weir ☐ Construction: concrete
Dimensions: Length 62.50 Ft. Depth 2 Ft.
5.2 Any low areas in addition to spillway: Yes ☐ No ☒
5.3 Any obstructions elevating spillway or weir: Yes ☐ No ☒
5.4 Capacity under normal conditions _____ C.F.S.
5.5 Freeboard: Normal 2 Ft. Flood _____ Ft. Adequate: Yes ☐ No ☒
5.6 Tailwater Area: Describe large stones in natural stream bed

RECEIVED NOV 9 1976

Discharge Pipes 1 Number, Size 14 Inches, Type Gate
.8 Gates: Type _____ Condition _____
How Operated: Manual ☒ Mechanical ☐

6.0 UPSTREAM EXPOSURES

6.1 Exposure to excessive ponding. Describe none

6.2 Effects of loss of pond. none

6.3 Evidence of landslide, shore erosion, ice flow. none

7.0 DOWNSTREAM EXPOSURES None prior to deuses reservoir, approx. 3500' distant

Structures, Pumping Stations No. _____ Bridges No. _____ Residential No. _____ Commercial No. _____ Industrial No. _____ Agricultural ☐ Railroads ☐ Highways ☐ Other _____

8.0 CONDITION & MAINTENANCE

8.1 Inspection Frequency weekly (min.) By Whom Res. Attendent
8.2 Relief Wells ☐ Toe drains ☐ Collector Pipes ☐ Underdrains ☐ Piezometers ☐
8.3 Who monitors _____ Frequency _____

9.0 OBSERVATIONS EARTHEN DAMS (Explain)

9.1 Evidence of sloughing or erosion. none noted

9.2 Evidence of seepage through dam or along outside toe of slope and abutments. see 10.1

9.3 Evidence of animal damage. none noted

9.4 Number and size of trees and bushes in dam. none-cut in 1975

9.5 Erosion around spillway or weir. none

10.0 OBSERVATIONS CONCRETE OR STONE DAMS (Explain)

10.1 Evidence of spawling, cracks, or seepage. seepage in toe along west side in a couple of areas. ~~Also stone has cracks since placement~~

10.2 State condition of spillway. good

10.3 State condition of tailwater area. good

10.4 Evidence of erosion along toe of slope and abutments. none noted

10.5 Dimensions of gallery and present use. N/A

11.0 Does dam qualify for inclusion under the National Program for Dam Inspection: Yes ☒ No ☐ . If so, what is hazard code?

12.0 ADDITIONAL COMMENTS AND OPINION

NOTE: A copy of the Geological Survey Map of the quadrant or quandrants in which the dam is located should be attached to the report. Locate the dam on the map.

APPENDIX B-3

1. Sample Inspection Form
2. Elevation - Capacity Curve
3. Plan and Profile of Embankment Cross-section

VISUAL INSPECTION CHECKLIST FOR DAMS

The Connecticut Water Company

Dam Name: Inspection Date:

Present at Inspection:

Reservoir Level:

General condition of slopes or dam faces:

Any evidence of erosion on upstream face?

On downstream face?

Any unwanted tree growth?

Any animal burrows in slopes?

Any notable earth movements?

Any spongy spots or noticeable seepage?

Spillway condition:

Spillway Obstructions:

Tail Race Conditions:

Downstream obstructions or undermining of spillway or splash pad:

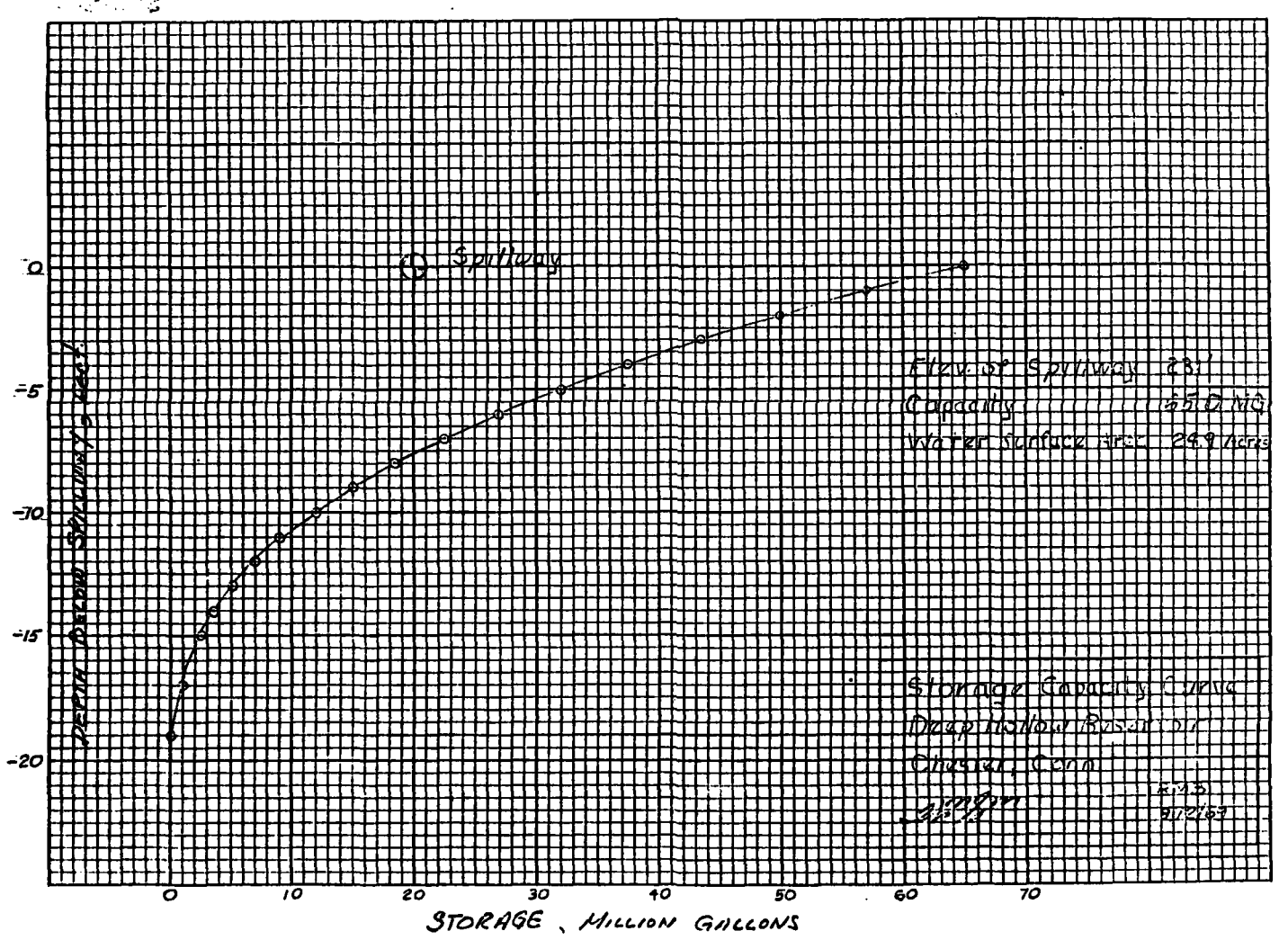
Comments or recommendations:

Prepared by: date

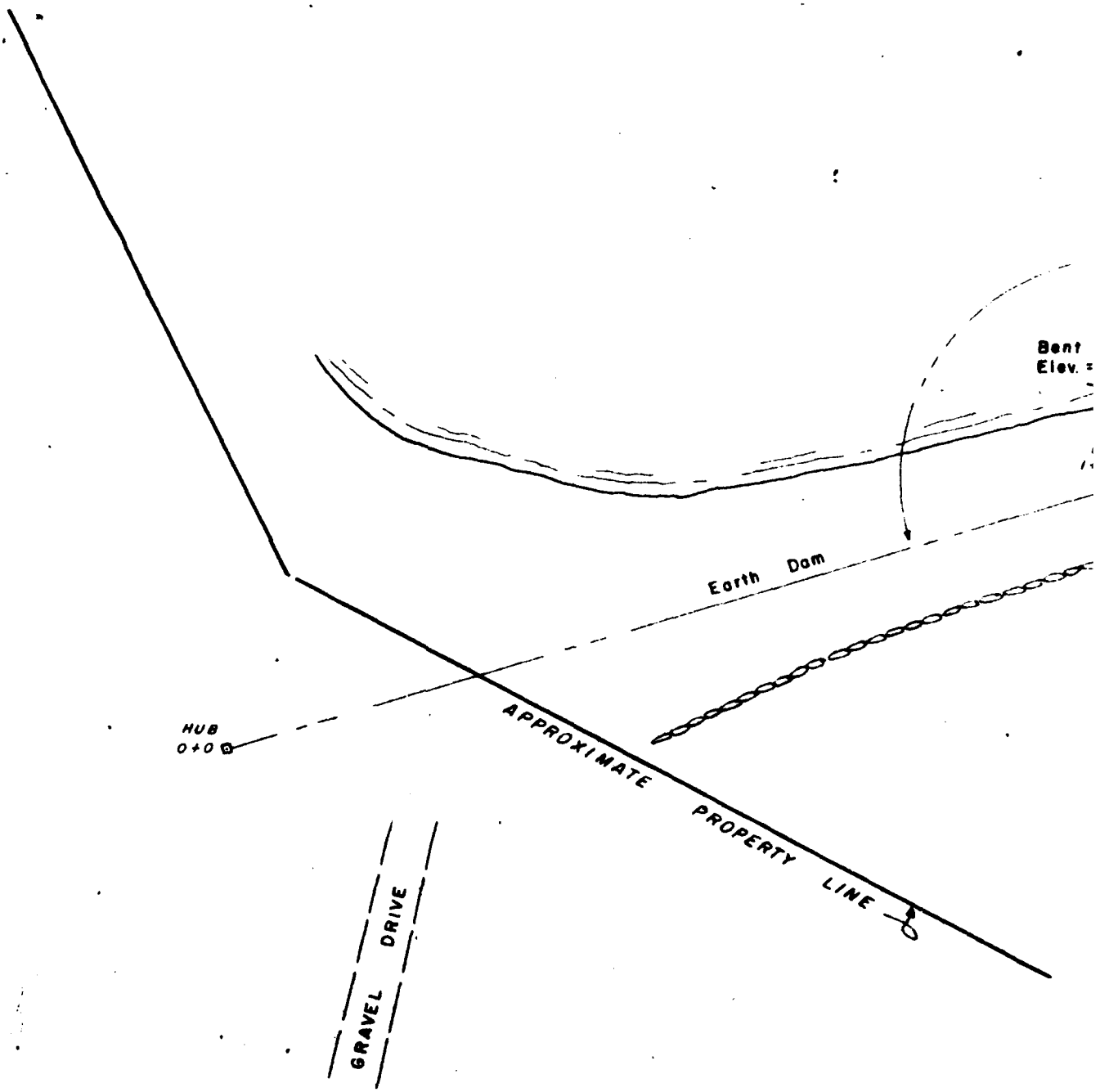
Reviewed by: date

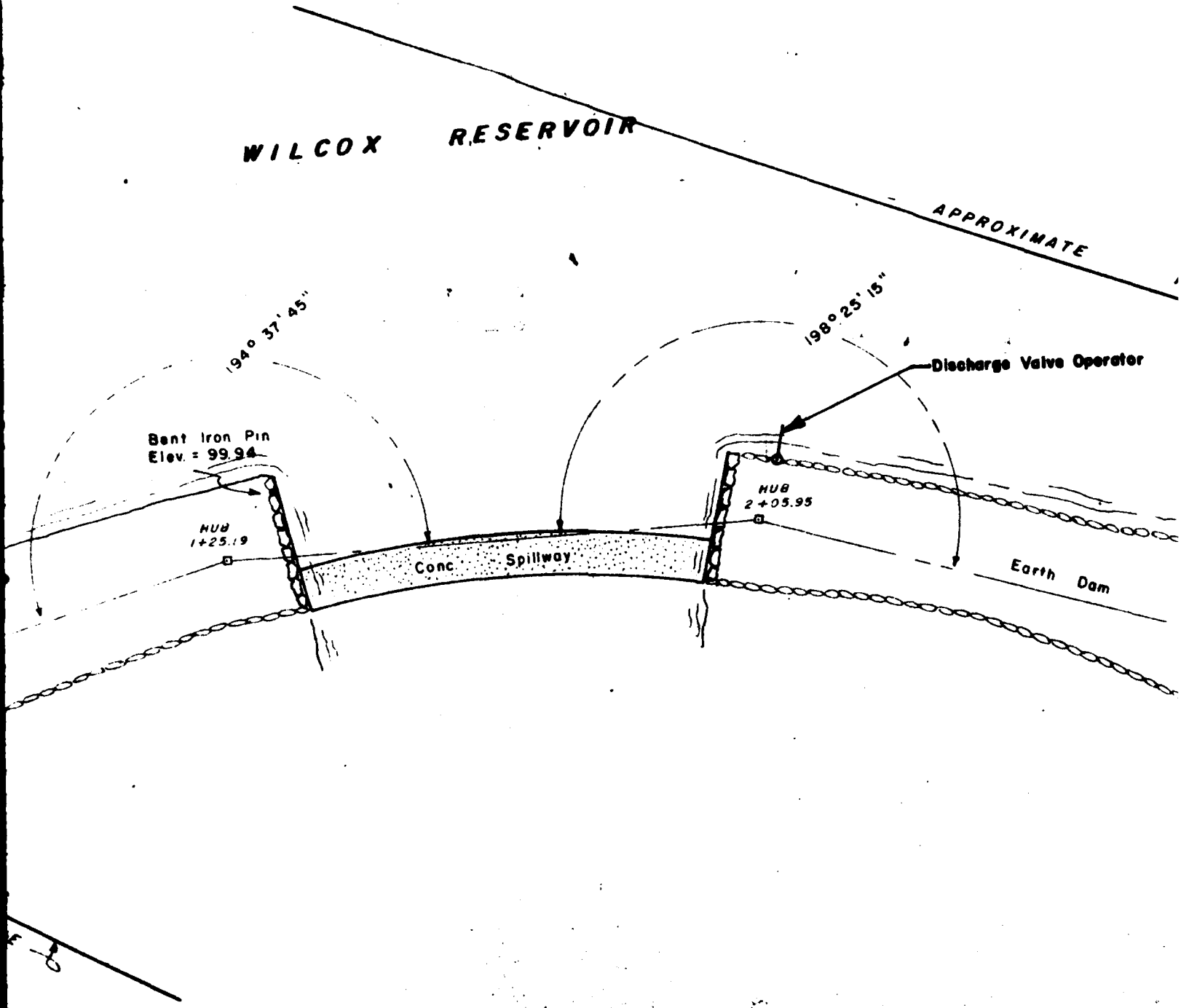
Distribution: KWK

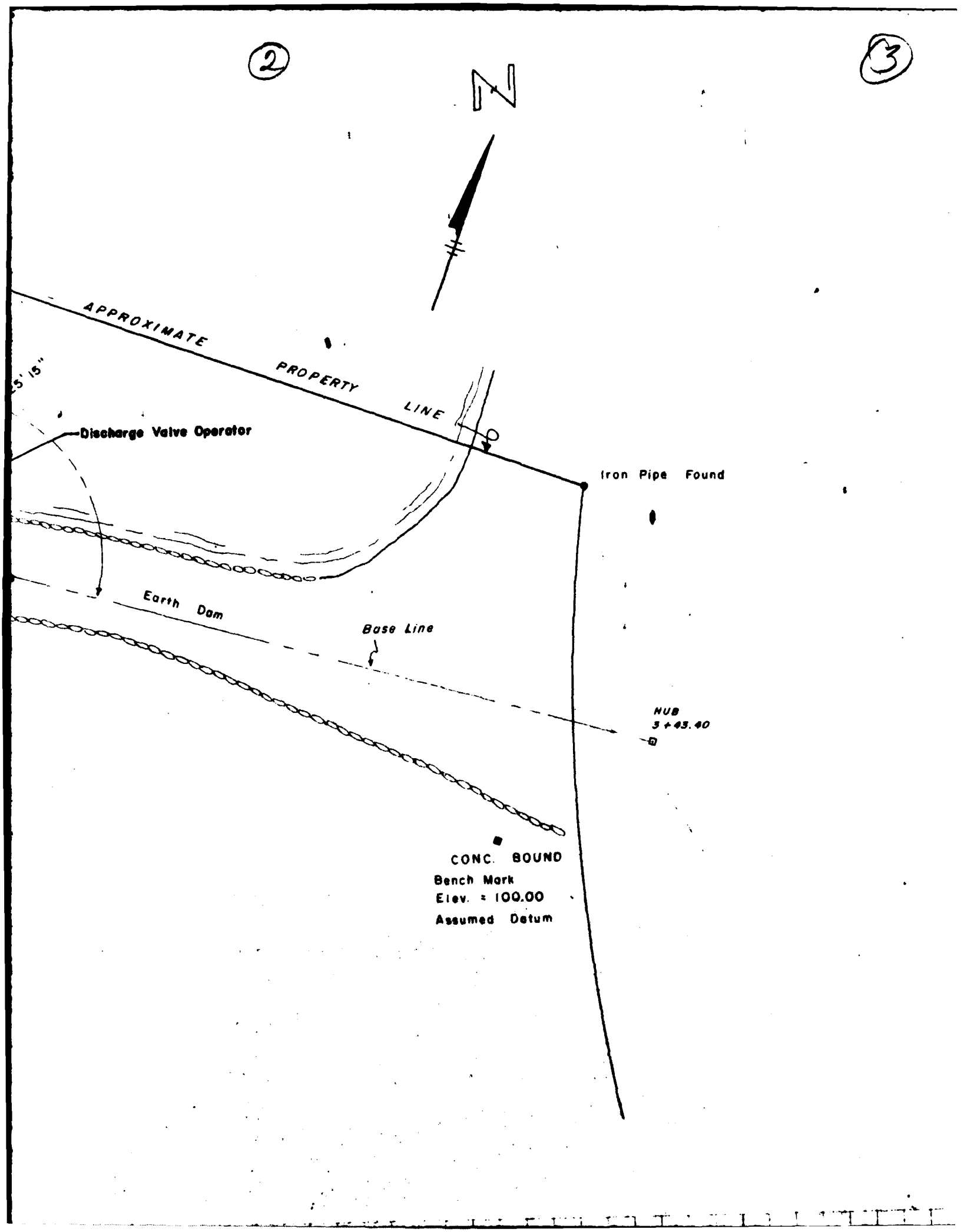
Qax-E-19

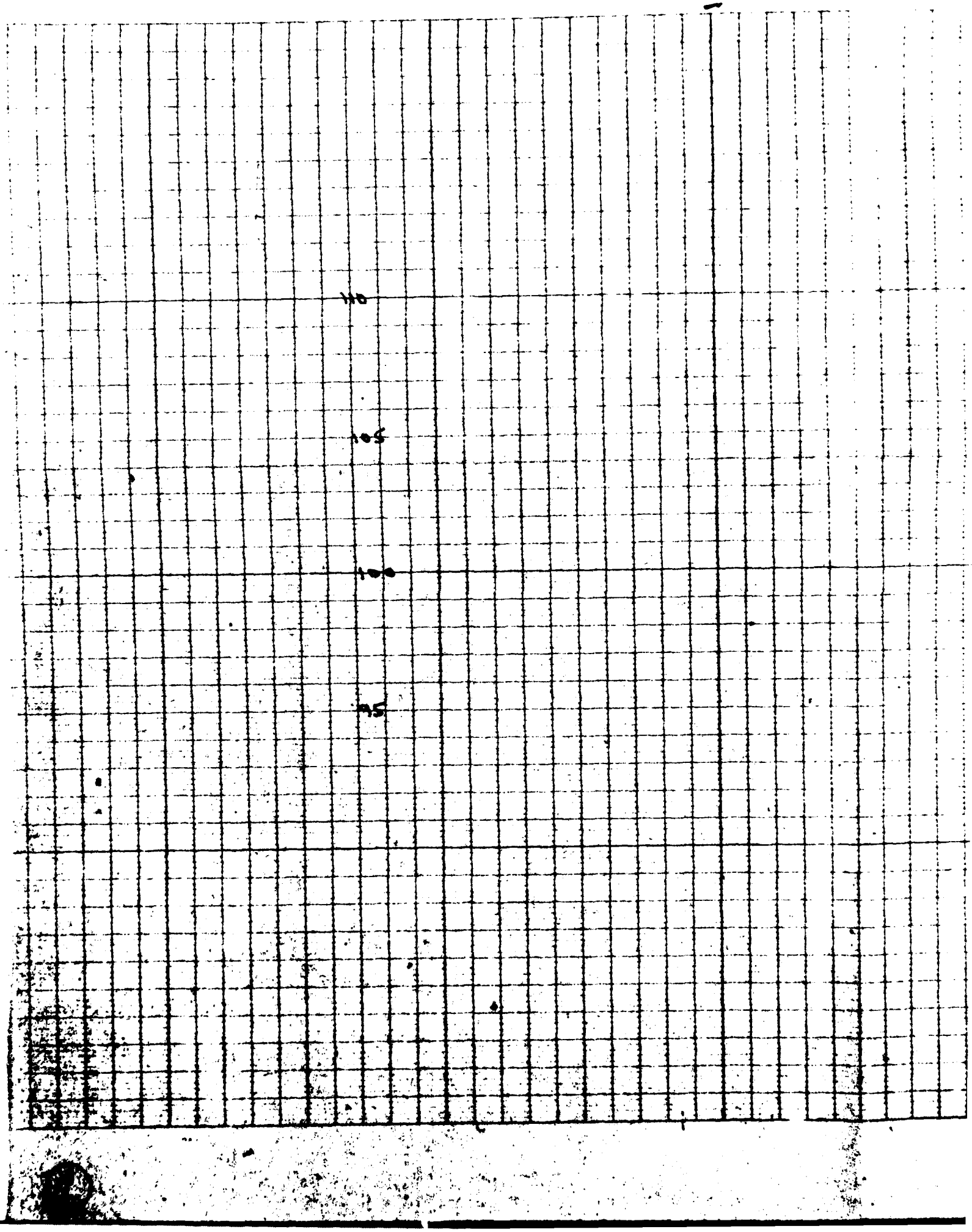


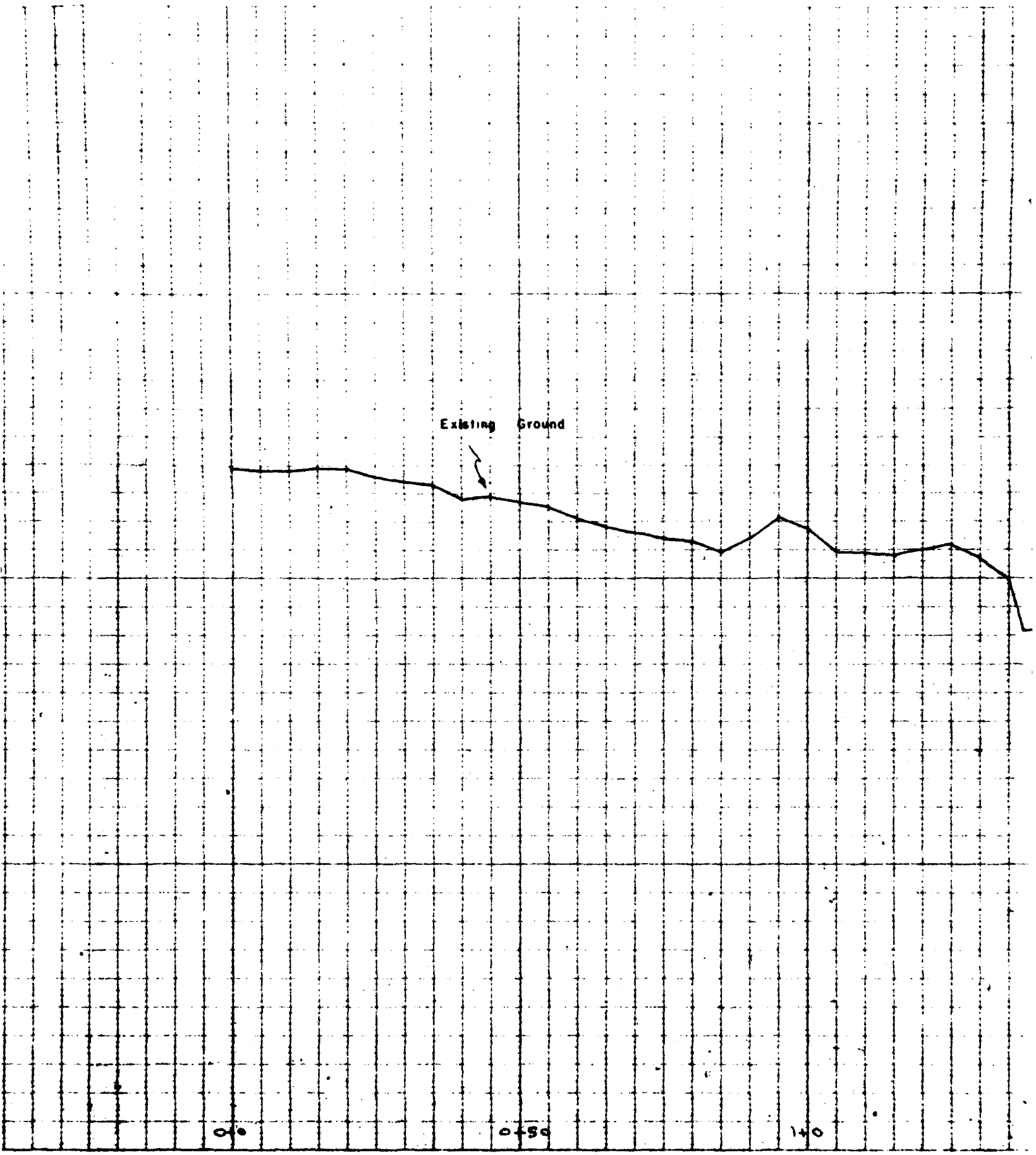
(1)

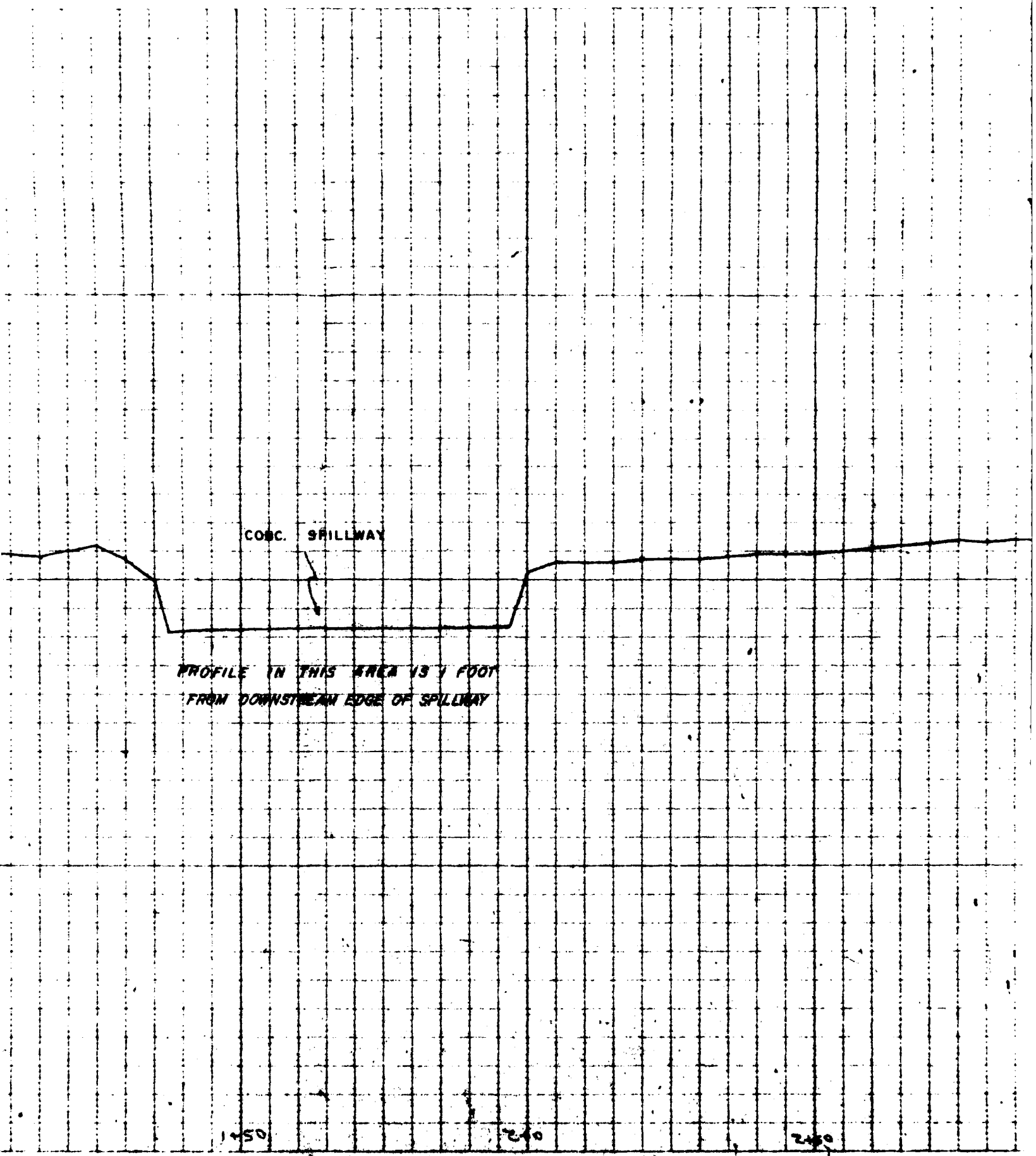

Bent
Elev. =
Earth Dam
HUB
0+0
APPROXIMATE PROPERTY LINE
GRAVEL DRIVE

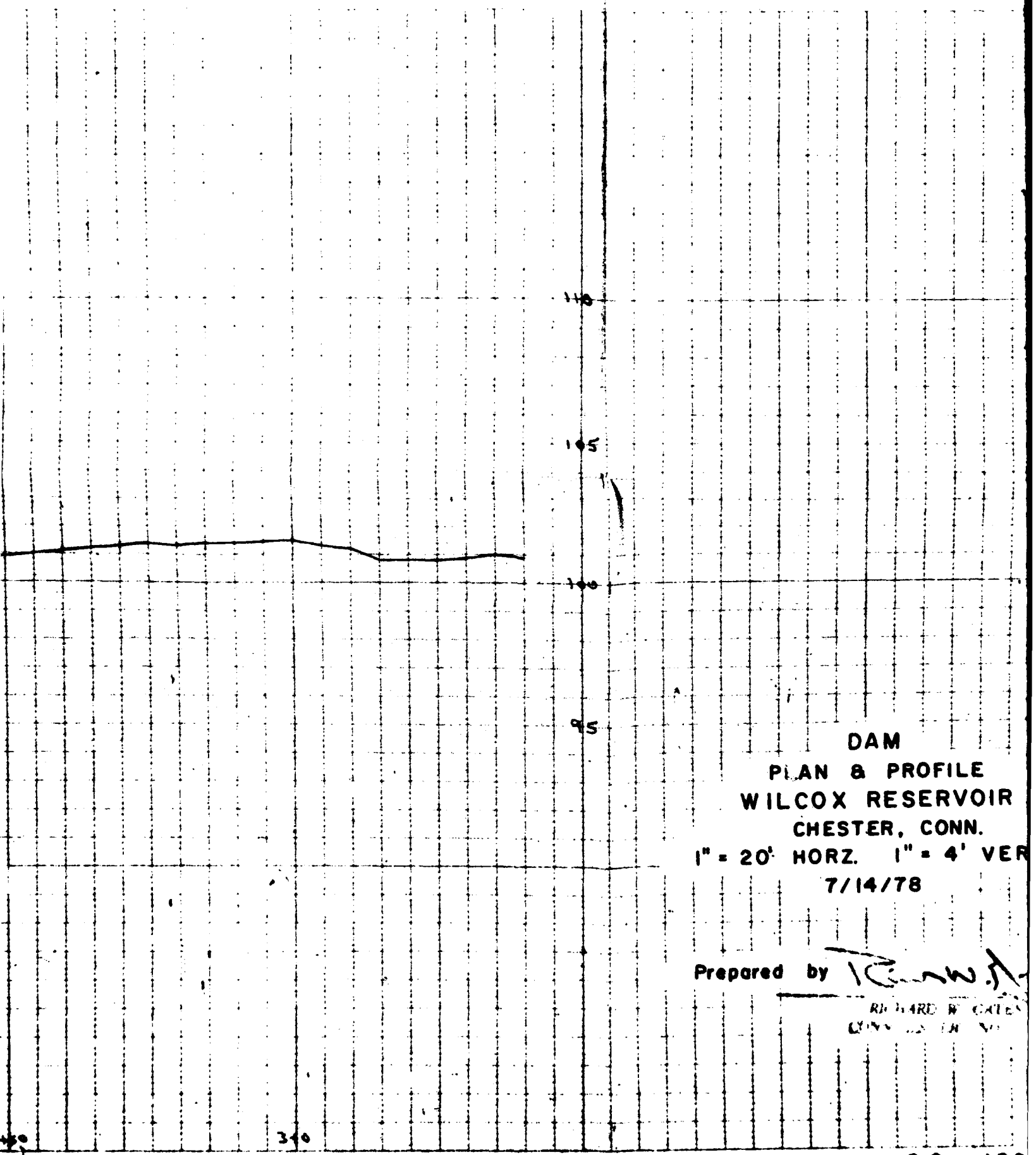

WILCOX RESERVOIR
APPROXIMATE
194° 37' 45"
198° 25' 15"
Discharge Valve Operator
Bent Iron Pin
Elev. = 99.94
HUB
1+25.19
HUB
2+05.95
Conc. Spillway
Earth Dam


2
3
N
APPROXIMATE
PROPERTY
LINE
5' 15"
Discharge Valve Operator
Iron Pipe Found
Earth Dam
Base Line
HUB
3+43.40
CONC. BOUND
Bench Mark
Elev. = 100.00
Assumed Datum


110
105
100
95


Existing Ground
0+0
0+50
1+0


CONC. SPILLWAY
PROFILE IN THIS AREA VS 1 FOOT
FROM DOWNSTREAM EDGE OF SPILLWAY
1450
2450



DAM
PLAN & PROFILE
WILCOX RESERVOIR
CHESTER, CONN.
1" = 20' HORZ. 1" = 4' VER
7/14/78

Prepared by

RICHARD W. GATES
CONNECTICUT NO.

GC - 188

(4)

DAM

PLAN & PROFILE

WILCOX RESERVOIR

CHESTER, CONN.

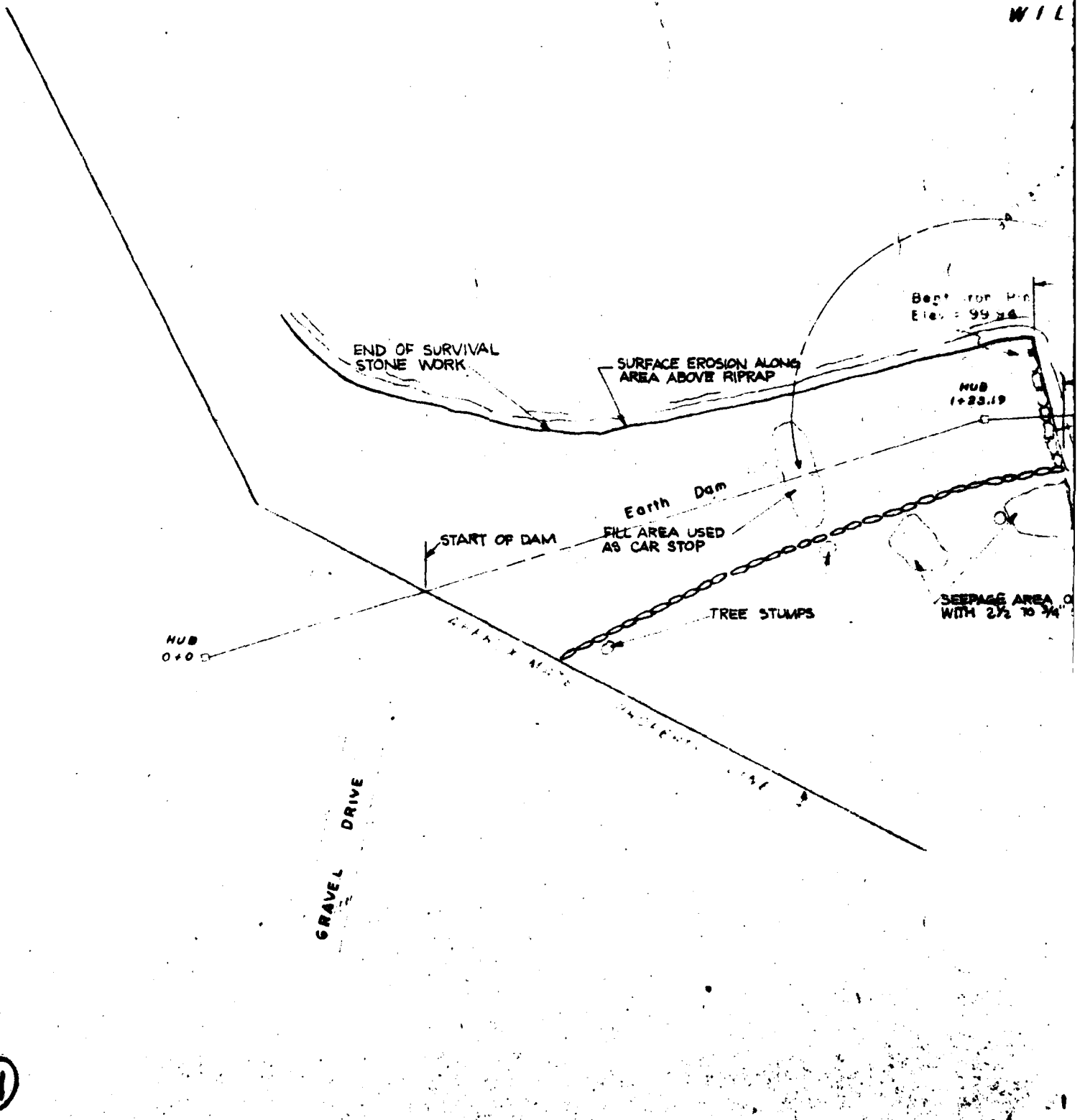
20' HORZ. 1" = 4' VERT.

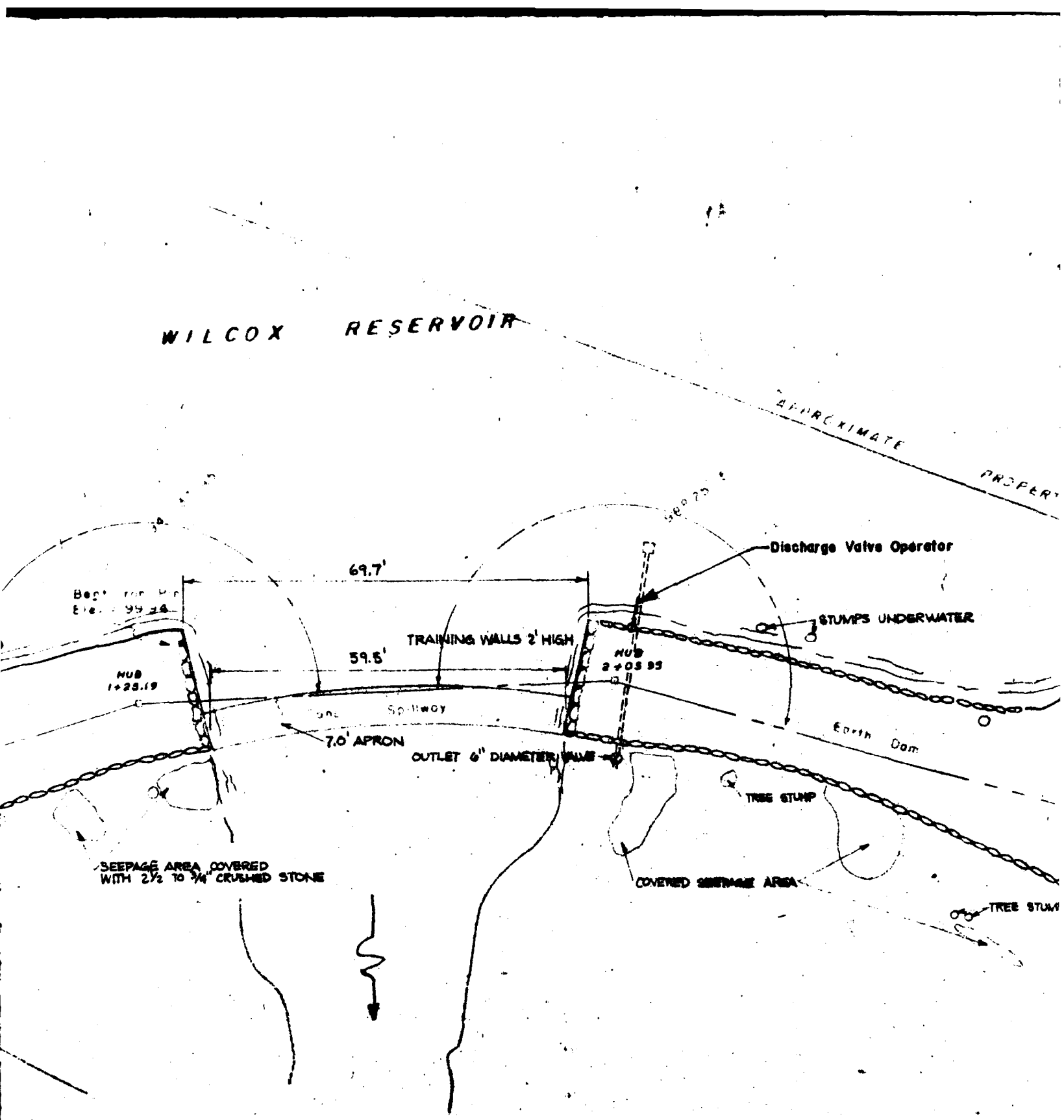
7/14/78

pared by

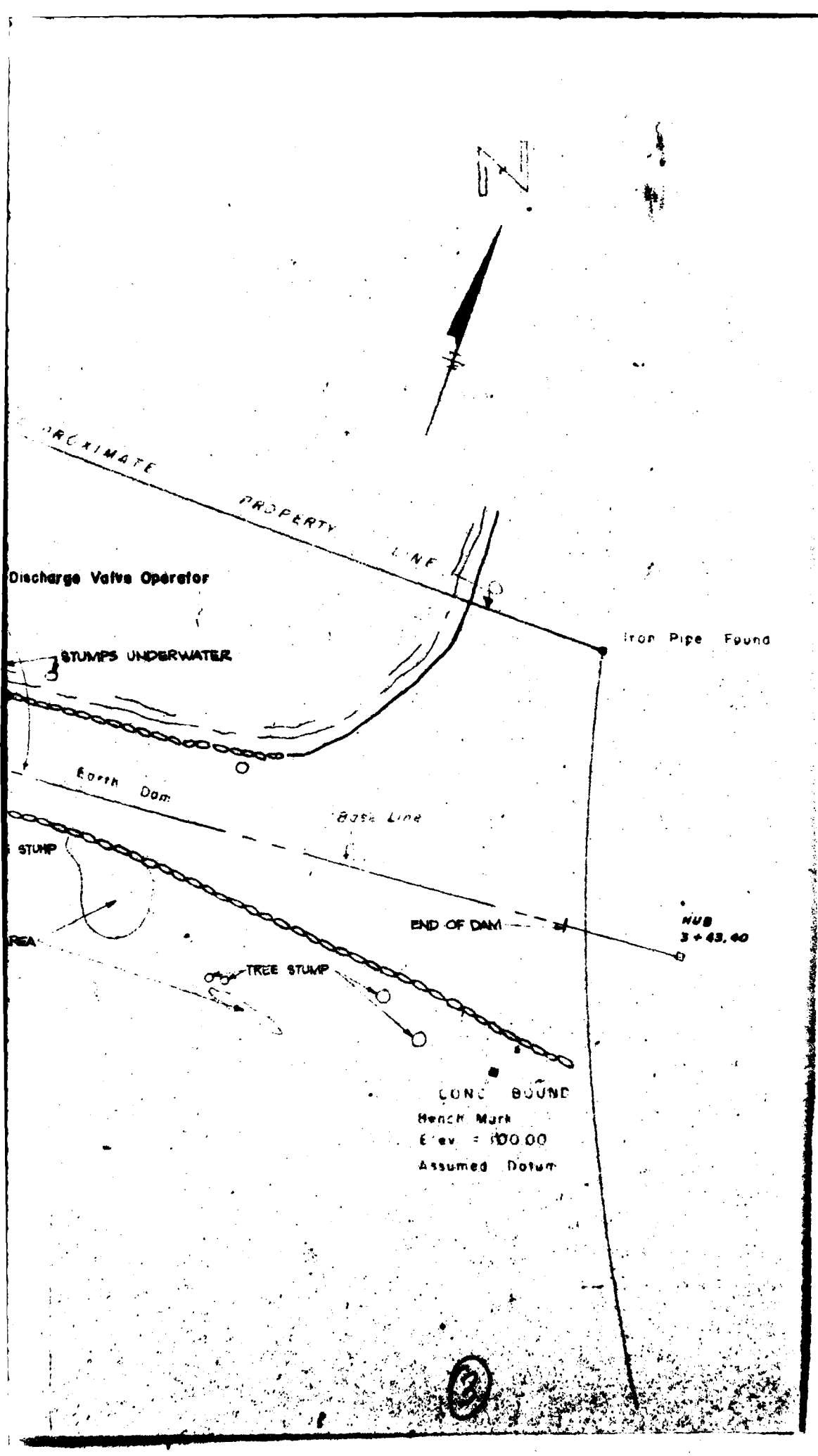
RICHARD W. CATES

GC - 188


END OF SURVIVAL STONE WORK
SURFACE EROSION ALONG AREA ABOVE RIPRAP
HUB 1+23.19
Earth Dam
START OF DAM
FILL AREA USED AS CAR STOP
TREE STUMPS
SEEPAGE AREA
HUB 0+0
GRAVEL DRIVE

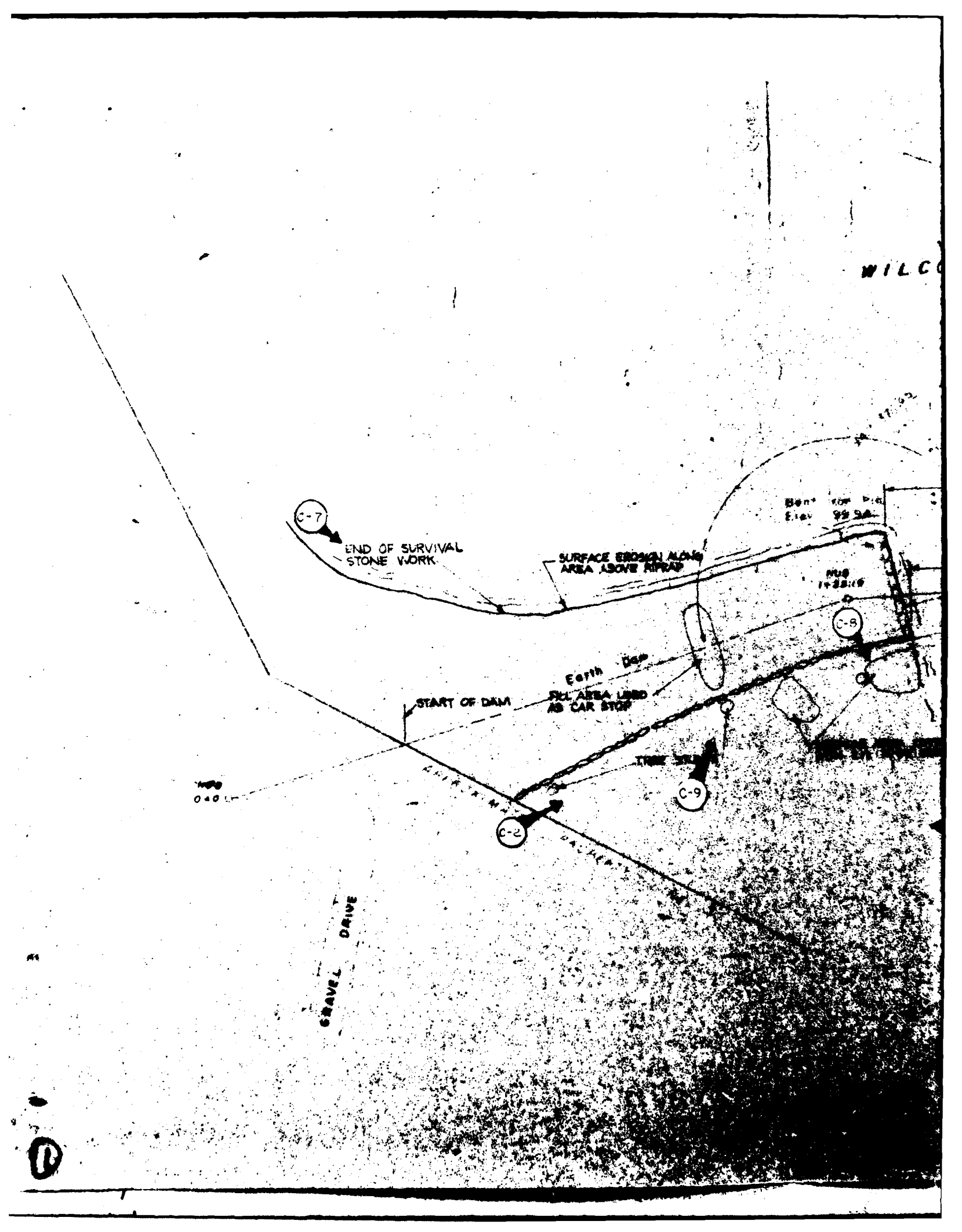


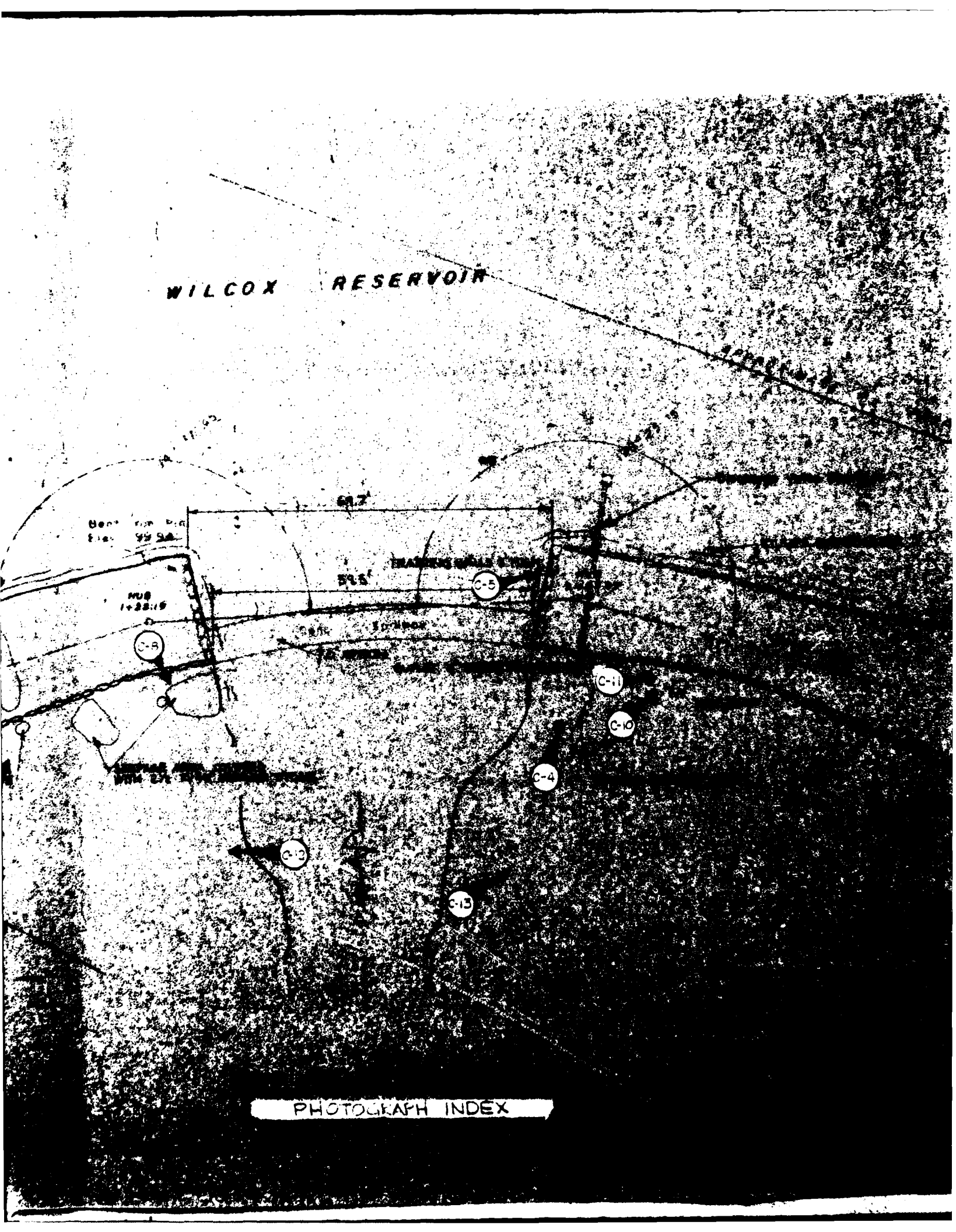
DEEP HOLLOW RESERVOIR DAM
GENERAL CONDITION PLAN


N
PROXIMATE
PROPERTY
LINE
Discharge Valve Operator
Iron Pipe Found
STUMPS UNDERWATER
Earth Dam
Base Line
STUMP
END OF DAM
NUB
3+43.40
TREE STUMP
CONC BOUND
Bench Mark
Elev = 100.00
Assumed Datum

APPENDIX C

SELECTED PHOTOS


C-7
END OF SURVIVAL
STONE WORK
SURFACE EROSION ALONG
AREA ABOVE RIPRAP
C-8
Earth Dam
START OF DAM
FILL AREA USED
AS CAR STOP
C-9
C-2
GRAVEL DRIVE



PHOTOGRAPH INDEX

C-6
C-3

C-2 DOWNSTREAM FACE LOOKING FROM RIGHT ABUTMENT TOWARD LEFT ABUTMENT

C-3 DOWNSTREAM FACE LOOKING FROM LEFT ABUTMENT TOWARD RIGHT ABUTMENT. (NOTE PATCHES OF CRUSHED STONE USED TO COVER SEEPAGE ZONES)

C-4 OUTLET WORKS - 12 INCH CAST IRON PIPE REDUCED TO 6 INCH DIAMETER AT VALVE. (NOTE LEAK IN PIPE AT FACE OF WALL)

C-5 CONTROL MECHANISM TO OPERATE UPSTREAM FLAP VALVE OF OUTLET CHAMBER.

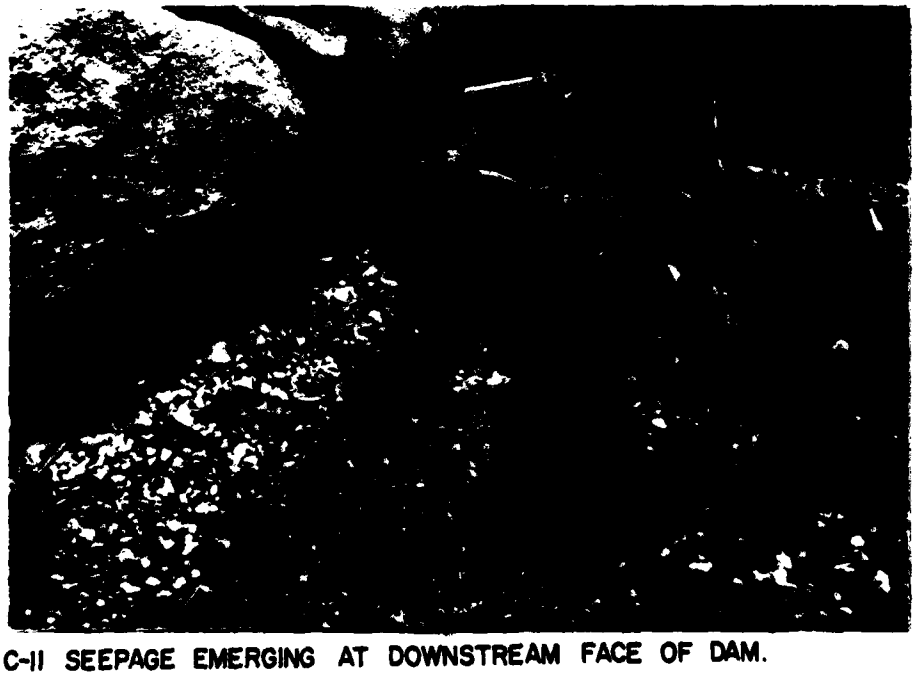
C-6 UPSTREAM FACE OF LEFT ABUTMENT SECTION OF DAM. (NOTE SURFACE EROSION IN FOREGROUND)

C-7 UPSTREAM FACE OF RIGHT ABUTMENT SECTION

C-8 DOWNSTREAM CHANNEL

C-9 ROTTING TREE STUMP AT DOWNSTREAM FACE OF DAM

C-10 SEEPAGE ZONE COVERED WITH DUMPED STONE



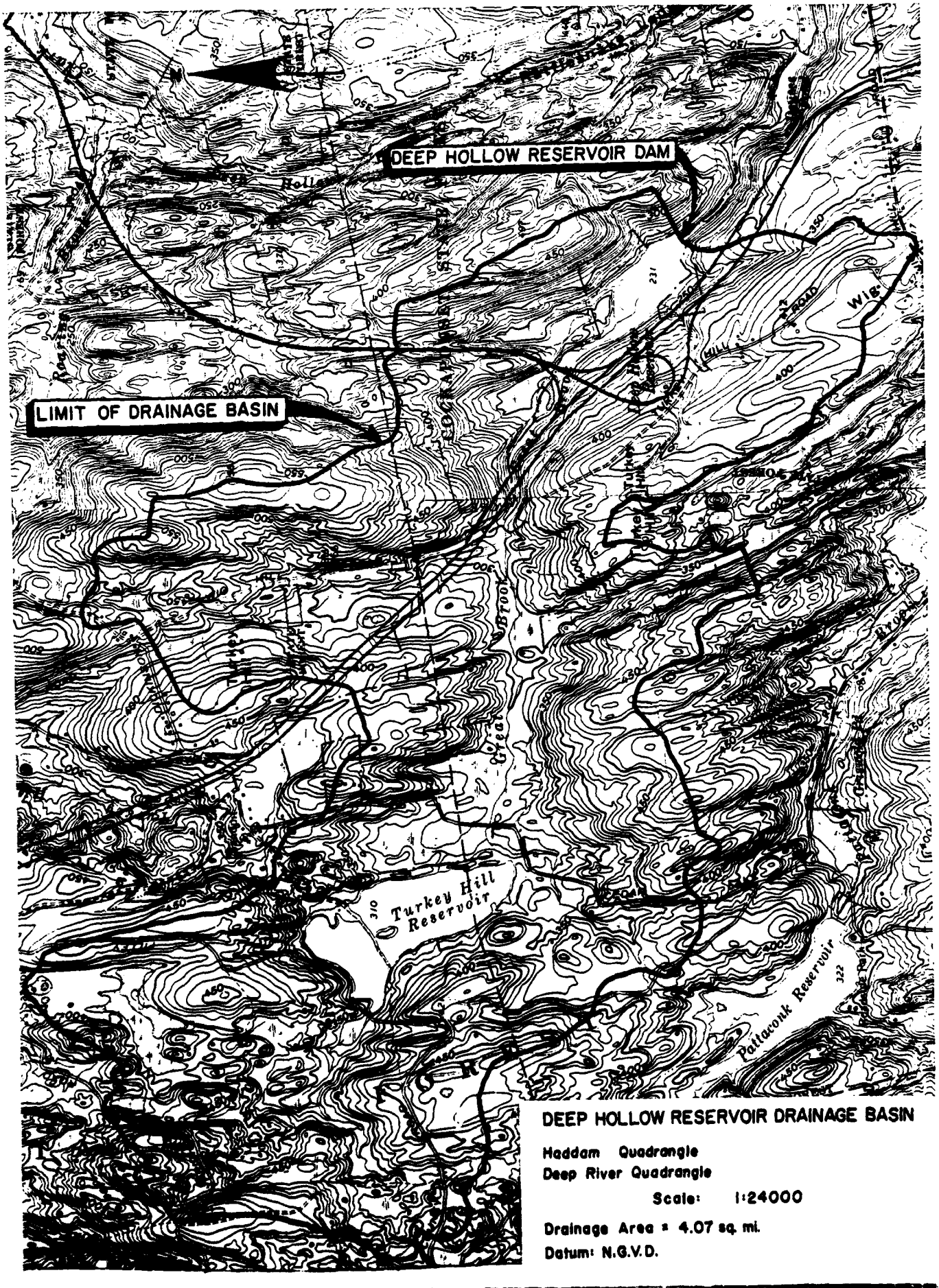
C-11 SEEPAGE EMERGING AT DOWNSTREAM FACE OF DAM.

C-12 SEEPAGE ZONE AT RIGHT HAND SIDE OF DOWNSTREAM CHANNEL

C-13 SEEPAGE ZONE AT LEFT HAND SIDE OF DOWNSTREAM CHANNEL

APPENDIX D

HYDROLOGIC COMPUTATIONS



DEEP HOLLOW RESERVOIR DRAINAGE BASIN

Haddam Quadrangle
Deep River Quadrangle

Scale: 1:24000

Drainage Area = 4.07 sq. mi.

Datum: N.G.V.D.

A. Size Classification

Height of Dam = 22.0 feet; Hence SMALL

at crest elevation reservoir storage = 200 AC-ft., hence SMALL

adopted size category SMALL

B. Hazard Potential

DAM IS LOCATED IN A PREDOMINANTLY RURAL, AGRICULTURAL AREA WHERE ITS FAILURE MAY CAUSE APPRECIABLE ECONOMIC LOSS WITH INTERRUPTION OF WATER SUPPLY USAGE DOWNSTREAM FOR DRINKING PURPOSES. FAILURE IS ALSO LIKELY TO CAUSE LARGE DAMAGE TO HILL ROAD AND ITS VICINITY NEAR THE TOWN OF CHESTER.

It is estimated from the rule of "thumb" failure hydrograph as follows:

Category	Loss of Life	Economic Loss
		Homes = NO
SIGNIFICANT	NIL	Buildings = NO
		Farms = NO
		Miscellaneous = YES
		Highways or roads = YES

C.

Hazard	Size	"Test Flood" or Spillway Design Flood
SIGNIFICANT	SMALL	100 YEAR TO ½ PMF

Adopted S.D.F. (test flood) = ½ PMF

Adopted value of test flood due to watershed characteristics = 900 CSM

Estimating Maximum Probable Discharges - Inflow and Outflow Values Date of Inspection: 7/20/78

Name of Dam DEEP HOLLOW RESERVOIR ; Location of Dam GREAT BROOK Town CHESTER, CT.

Watershed Characterization ROLLING HILLS WITH SWAMPS

Adopted "test" flood = HALF PMF = 900 CSM = 3708 C.F.S.

D.A. = Drainage Area = 4.12 Square Miles = _____ Acres

S.A. = Surface Area of Reservoir = 0.043 Square Miles = 27.50 Acres

Shape and Type of Spillway = BROADCREST-CURVED IN PLACE-OVERFLOW-UNCONTROLLED-VERTICLE FELL

B = Width of Spillway = 60 feet; C = Coefficient of Discharge = (3.09 − Friction) = 300

Maximum Capacity of Spillway Without Overstopping = 508 C.F.S. = 13.7 % of test flood

Top of Dam Elevation = 233.00 ; Spillway Crest Elevation = 231.00

Length of Dam = 352 feet

Name of Dam	Test Flood Qp_1		Inflow Characteristics		Outflow Characteristics First Approximation			Outflow Characteristics Second Approximation			Outflow Characteristics Third Approximation		
	CSM	CFS	h_1 in feet	S_1 in inc.	Qp_2 CFS	h_2 in feet	S_2 in inc	S_3 in inc	h_3 in ft.	Qp_3 CFS	S_4 in inc.	h_4 in ft.	Qp_4 CFS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
DEEP HOLLOW RESERVOIR DAM		3708	4.09	0.51	3708	4.09	0.51	0.506	4.05	3618	0.508	4.07	3653

Qp = Discharge; h = surcharge height S = Storage in inches

NOTE: Outflow discharge values are computed as per C.O.E. guidelines but with due consideration given to storage in reservoir and maximum spillway capacity.

Overtopping Potential

Spillway crest elevation = 231.00 M.S.L.

Top of dam elevation = 233.00 M.S.L.

Maximum discharge capacity of Spillway without overtopping = 508 C.F.S.

"Test flood" outflow discharge = 3653 C.F.S.

% of "Test flood" carried by Spillway without overtopping = 14% 1

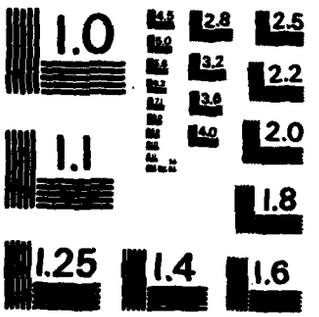
"Test flood" outflow discharge which flows over the dam = 3145 C.F.S.

= 86 % of "Test flood" 2

1 + 2 = 100%

AD-A144 743 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS DEEP HOLLOW RESERVOIR..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV OCT 78 1/2

UNCLASSIFIED F/G 13/13 NL



"Rule of Thumb Guidance for Estimating
Downstream Dam Failure Hydrograph"

BASIC DATA

Name of dam: Deep Hollow Reservoir Dam Name of town Chester, Connecticut

Drainage area = 4.12 sq. mi. Top of dam 233.00 NGVD

Spillway type = Broad crest - overflow Crest of spillway 231.00 NGVD

Surface area at crest elevation = 27.50 acres

Reservoir bottom near dam = 212.00 NGVD

Assumed side slopes of embankments = 2:1

Depth of reservoir at dam site 22.0 ft = y_o = 22.0 adopted

Mid-height elevation of dam = 220.00 NGVD

Length of dam at crest = 352 ft.

Length of dam at mid-height = 308 ft.

40% of dam length at mid-height - W_b = 123 ft.

Step 1:

Elevation NGVD	Reservoir Estimated Storage In AC-ft.	Remarks
231.0	200	
232.0	227	
233.0	255	
234.0	282	
235.0	310	
236.0	337	

Step 2:

$$Q_{pl} = \frac{8}{27} W_b \sqrt{g}\, y_o^{3/2}$$

$$= 1.68\, W_b\, y^{3/2} = 21{,}323 \text{ CFS}$$

Failure is assumed to be instantaneous when the pool reaches the top of the dam.

DAM FAILURE ANALYSIS

DEEP HOLLOW RESERVOIR DAM

1.	Failure discharge with pool at top of dam	=	21,323 CFS
2.	Depth of water in reservoir at time of failure	=	22 ft.
3.	Maximum depth of flow downstream of dam at time of failure	=	14 ft.
4.	Water surface elevation just downstream of dam at time of failure	=	226 NGVD

Deuces Pond is located 3,000 ft. downstream of Deep Hollow Reservoir Dam. Valley storage between these two reservoirs is not significant in reducing the discharge. There is a 70-ft. Elev. differential into Deuces Pond which will cause the dissipation of wave and kinetic energy of the failure discharge. Increase of depth in Deuces Pond due to failure of Deep Hollow is likely to be about 7± feet. There is no development between these two ponds. Consequently it is estimated that the water surface elevation between Deep Hollow and Deuces Pond will be from 226 NGVD to 167 NGVD. The discharge below Deuces Pond will flow obeying Manning's formula as a uniform flow. The flow will have the following hydraulic characteristics:

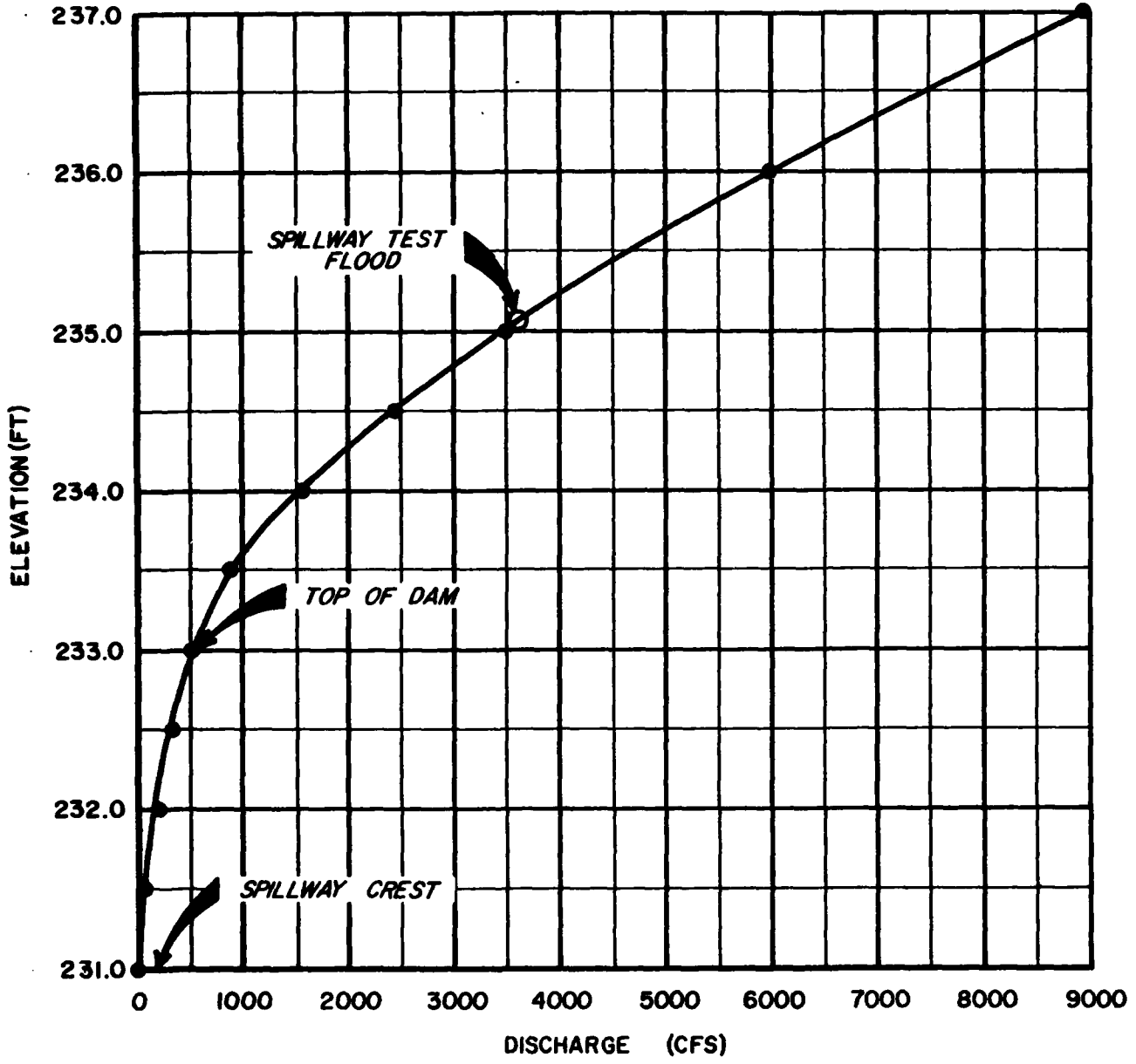
Q	=	21,300 CFS
s	=	0.006
n	=	0.05
b	=	70± ft.
d	=	5.6± ft.
Side slopes	=	2H to 1V

Spillway Rating Curve
Deep Hollow Reservoir Dam

Spillway Width = 60 ft.; Spillway Crest = 231.0 NGVD
Length of Dam = 352 ft.; Top of Dam = 233.0 NGVD
C = 3.0

Elevation (ft.) NGVD	Discharge (CFS)	Remarks
231.0	0	Spillway Crest
231.5	64	
232.0	180	
232.5	331	
233.0	509	Top of Dam
233.5	882	
234.0	1,565	
234.5	2,449	
235.0	3,496	
236.0	5,996	
237.0	8,957	

Frequency and Discharge (CFS)	Elevation (Ft.) NGVD
Q_{10} = 690	233.30
Q_{50} = 1,100	233.65
Q_{100} = 1,182	233.74
Test Flood (1/2 PMF) = 3635	235.00



SPILLWAY RATING CURVE
DEEP HOLLOW RESERVOIR DAM

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
CT	398	NED	CT	007	02				DEEP HOLLOW RESERVOIR DAM	4124.9	7229.1	00	OCT	78

POPULAR NAME	NAME OF IMPOUNDMENT
	DEEP HOLLOW RESERVOIR

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	0A	GREAT BROOK	CHESTER	2	3100

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE–FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REGRPG	1854	S	26	26	255	200	NED	N	N	N		

REMARKS

D/S NAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	352	U	63	509			0									

OWNER	ENGINEERING BY	CONSTRUCTION BY
CONNECTICUT WATER CO	UNKNOWN	UNKNOWN

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
C-E MAGUIRE INC.	20	JUN	78	PL 92-367

REMARKS


DAT
ILM